

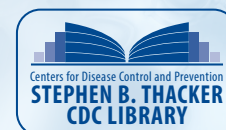
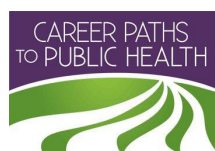
CENTER FOR SURVEILLANCE, EPIDEMIOLOGY, AND LABORATORY SERVICES



Our Services. Our Work. Our Impact.

Center for Surveillance, Epidemiology, and Laboratory Services





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TABLE OF CONTENTS

Director's Message	3
CSELS at a Glance—FY2016	4
Get to Know Us	6
Our Center, Our Work	7
Our Divisions	8
Our Priorities, Our Impact	9
Protecting America's Health From One Century to the Next	10
Our Roadmap: The CSELS Strategic Framework	12
Our Services. Our Work. Our Impact.	14
Health Informatics and Surveillance	16
Overview	17
Data Hub	19
Information Systems	21
National Notifiable Diseases Surveillance System (NNDSS)	23
National Syndromic Surveillance Program (NSSP)	25
Laboratory Systems	28
Overview	29
Biorepository Science and Services	31
Clinical Laboratory Improvement Program	33
Informatics and Data Science	35
Training and Workforce Development	37
Public Health Information Dissemination	40
Overview	41
<i>CDC Vital Signs</i>	43
The Community Guide	45
Informatics Innovation Unit (IIU)	47
<i>Morbidity and Mortality Weekly Report (MMWR) Series</i>	49
Office of Public Health Genomics	51
Stephen B. Thacker CDC Library	53

Scientific Education and Professional Development	56
Overview	57
Academic Partnerships to Improve Health (APIH): Public Health Fellowships	59
Accreditation for CDC Learning Activities	61
Career Paths to Public Health (CPP)	63
CDC-Hubert Global Health Fellowship	65
CDC Steven M. Teutsch Prevention Effectiveness Fellowship (PEF)	67
Developing Quality Public Health Learning Products	69
Epidemic Intelligence Service (EIS)	71
Epidemiology Elective Program (EEP)	73
Laboratory Leadership Service (LLS) Fellowship Program	75
Population Health Workforce Initiative (PHWI)	77
Presidential Management Fellows (PMF) Program	79
Preventive Medicine Residency and Fellowship (PMR/F)	81
Promoting Quality Public Health Learning Opportunities	83
Public Health Informatics Fellowship Program (PHIFP)	85
Strengthening Health Systems Through Interprofessional Education (SHINE)	87
Office of the Director	90
Overview	91
CDC Biosurveillance Coordination Activity	93
Health Information Strategy Activity	95
Program Integration Unit (PIU)	97
Surveillance Data Platform (SDP) With Shared Services	99
The Road Ahead	102
Emerging Health Threats	103
Laboratory Safety	104
The Changing Healthcare Landscape	105
Infrastructure Upgrades	106
Our Leadership	108
Center Leadership	109
Division Leadership	111
The Nation's Investment	114
Where Our Funding Comes From	115
Where Our Funding Goes	117
How We Manage Our Funding	119

DIRECTOR'S MESSAGE

As the first permanent Director of the Center for Surveillance, Epidemiology, and Laboratory Services (CSELS), it is my pleasure to share with you the first comprehensive summary of our center's work—the history of our programs, our 2016 accomplishments, and our vision for the future.

CSELS was established at the Centers for Disease Control and Prevention (CDC) in October 2013, although the roots of our center are as old as CDC itself. CSELS tracks America's health, strengthens laboratory networks, and helps to identify the most urgent health threats around the country and around the world. Our approximately 400 staff and 300 contractors focus on improving public health surveillance, laboratory systems, and information and data quality while also ensuring the development of a sustainable, highly-trained public health workforce.

In 2015, we completed a process designed to streamline the management and operations of our center and keep us poised to continue delivering high-quality scientific support services to our partners both inside and outside CDC. We then embarked on a “bottom up” strategic planning process, guided by the priorities of our 4 divisions and more than 30 programs, to create an overarching Strategic Framework that captures the breadth of our work and provides a lens through which we can show you our story.

This book represents the culmination of that strategic process. It describes the accomplishments and impact of our programs—some long-established and some brand new. Read about CDC flagship programs, such as the *Morbidity and Mortality Weekly Report* and the Epidemic Intelligence Service. Learn about some of CDC's newest innovations, such as the National Syndromic Surveillance Program's cloud-based Biosense 2.0 platform and the Laboratory Leadership Service Fellowship Program. The CSELS Strategic Framework describes the programs under the CSELS umbrella and introduces the leadership team. We also give you a preview of our priorities for the coming years in emerging health threats, laboratory safety, infrastructure upgrades, and the changing healthcare landscape.

CSELS is a learning organization, operating at the frontiers of science. In any learning organization, change is part of the growth process. At CSELS we're always seeking new ways to keep the gears of America's public health system turning. We strive to be ready to respond to tomorrow's health threats, take advantage of improving technologies, and be at the forefront in providing the most up-to-date scientific services to advance public health.

We believe in focusing on customer service. It's our privilege to serve our colleagues at CDC and throughout the public health community by providing the best possible scientific support. Improving and modernizing our scientific infrastructure enables CDC to deliver a more comprehensive public health impact. My vision is to arrive at a point where CSELS is the place to which our partners turn when they need CDC scientific services, where our name is synonymous with value-added quality and efficiency, and where we can consistently help our partners when they need us most.

Michael F. Iademarco, MD, MPH

Director, Center for Surveillance, Epidemiology, and Laboratory Services

Captain, U.S. Public Health Service





CSELS AT A GLANCE—FY2016

Established **October 2013**

Unites more than **30 programs**
across **4 divisions**

Oldest program is the **Epidemic
Intelligence Service**, launched in **1951**

Newest program is the **Surveillance Data Platform
With Shared Services**, launched in **2016**

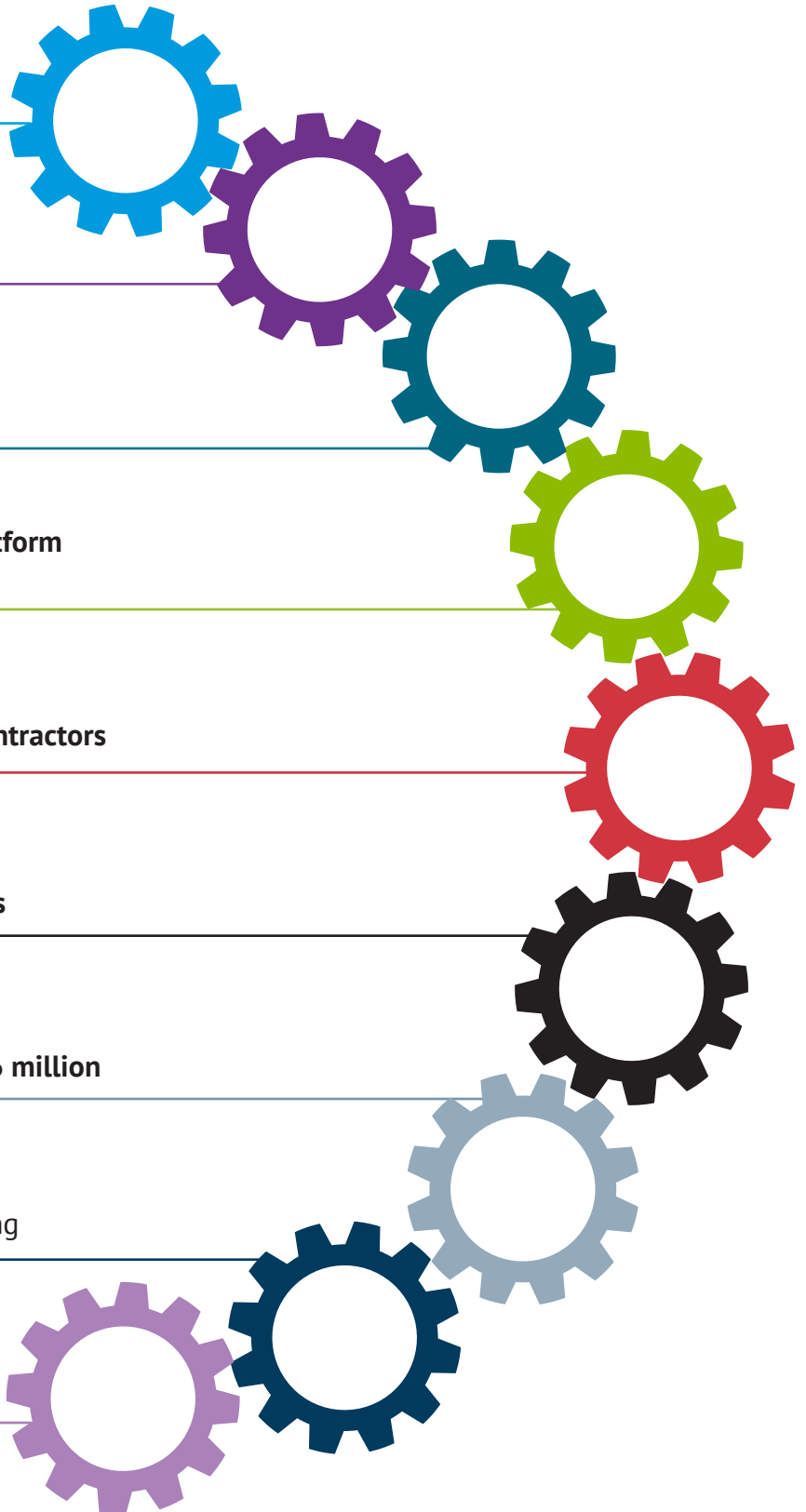
Composed of approximately **700 staff and contractors**

Supported training for more than **280 fellows**

Authorized for an operating budget of **\$197.6 million**

Provided **\$112.5 million** in extramural funding

Awarded grants and cooperative
agreements to **50 states**, the **District of
Columbia**, and **7 U.S. territories**





This 1975 photograph was captured inside a local field office during smallpox eradication efforts in Bangladesh. The keeping of detailed records was extremely important for proper tracking and intervention. This kind of data collection and analysis is one of the hallmarks of sound epidemiologic science. In Bangladesh, local residents who became vaccinators and data collectors played a profound role in the success of the smallpox eradication program. As members of the community, they were familiar and trusted, spoke the local dialect, and enhanced communication with residents.



Get to Know Us

Our Center

If you've ever had a blood test done, we've touched your life. If you've lived in a community where a disease outbreak occurred, we were there with you. If your doctor has you try the latest recommended treatment to manage your health, or your local health department is able to hire the best and brightest who have trained on the front lines of a health crisis, chances are we had something to do with it.

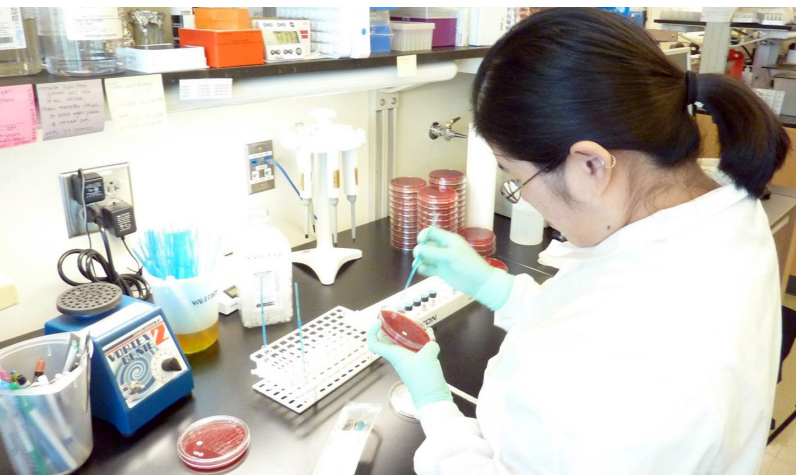
We're the **Center for Surveillance, Epidemiology, and Laboratory Services (CSELS)**. We're a collection of more than 30 programs that together form the backbone of much of the nation's public health system. We provide the **scientific service, expertise, skills, and tools** to support CDC's efforts to promote health, prevent disease, and prepare for emerging health threats. We make sure that scientists, researchers, healthcare providers, policymakers, and decision makers have the **systems, standards, and training** they need to keep us safe, healthy, and informed.



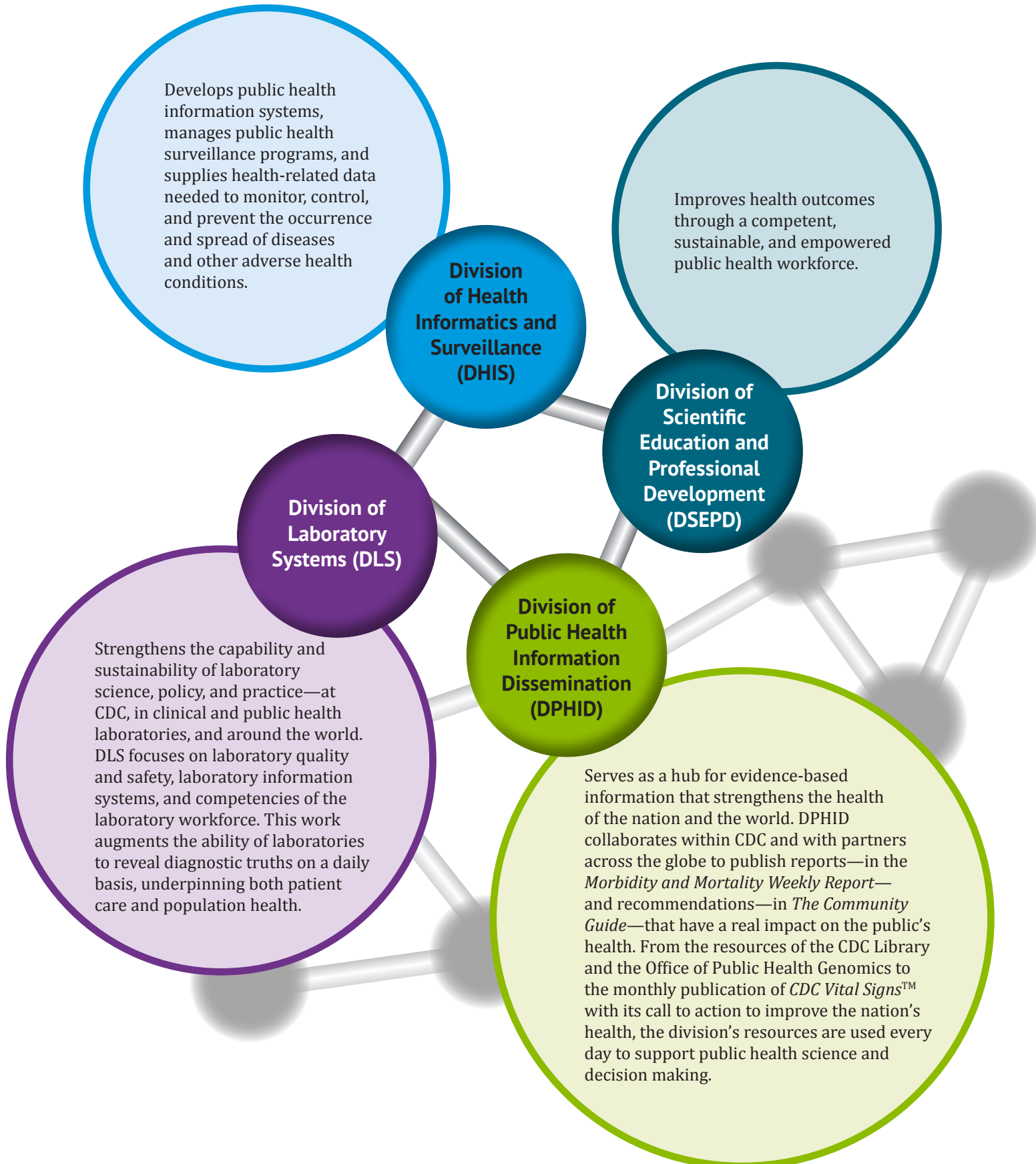
Our Mission: To provide scientific services to advance public health

Our Work

CSELS focuses on improving information and data quality, laboratory systems, and the public health workforce. Our crosscutting programs are spread across four divisions. Some of our programs—like the **CDC Library** and the **Morbidity and Mortality Weekly Report (MMWR)**—have a long and robust history as flagship components of CDC. Other programs—like our **Office of Public Health Genomics** or our sophisticated **disease-tracking systems**—reflect the changing landscape of science and medicine. One thing hasn't changed over the years: regardless of how the programs are packaged, we modernize, we innovate, and we're here to serve.



Our Divisions



Our Priorities

All CSELS activities are organized around a Strategic Framework to move us toward four overarching goals.



1
Transform the public health system

We lead a national surveillance strategy for human health, which builds on current resources, establishes priorities for next-generation technologies, and provides timely, comprehensive, and accessible information to strengthen public health practice and provide value to clinicians. We also develop standards for health informatics and strengthen the quality and safety of laboratory practices.

2
Prepare the health workforce

We lead national efforts in scientific education and professional development to ensure that researchers, technicians, healthcare providers, and communicators are ready to take our health system forward. We ensure that the people who keep the public healthy and safe have the quality, timely, and useful guidance, products, and services to do their jobs better.

3
Target strategic partnerships

We build partnerships that touch all aspects of health. We create linkages among a range of partners and stakeholders—across CDC and other federal agencies, and in the scientific, health care, and public health communities. We're a place where many perspectives intersect and where experts across disciplines can come to consensus to benefit the public's health and safety.

4
Optimize operations

We maximize the center's impact by recruiting and retaining dynamic leaders and expert staff. CSELS effectively manages how the center operates to improve internal performance through exemplary business service, innovative practice, and continuous workforce development.

Our Impact

CSELS work makes a difference. Some of our work you may recognize; some of it is in the background keeping the gears of our health system turning. Here are just a few of the ways we make an impact on the nation's health and safety.



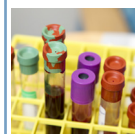
As the "voice of CDC," the **MMWR** has been CDC's primary scientific publication for more than 50 years. It's where emerging public health problems such as Legionnaires' disease, HIV/AIDS, and severe acute respiratory syndrome (SARS) were all first reported.



Our CDC and ATSDR Specimen Packaging, Inventory, and Repository (CASPIR) is a centralized resource to manage and preserve CDC's millions of valuable specimens for scientists and researchers studying the next disease outbreak or cutting-edge diagnostics.



Dubbed "the Swiss Army knife" for field-deployed epidemiologists, **Epi Info™** is free software that lets professionals around the world create tools, reports, and maps to rapidly address emerging health problems.



The standards, guidelines, and tools we develop help translate **Clinical Laboratory Improvement Amendments (CLIA)** into practice, ensuring quality laboratory testing for quality health care.



We run the **Epidemic Intelligence Service (EIS)** that gives health professionals a 2-year, postgraduate stint on the front lines of public health, learning and practicing epidemiology in more than 100 field investigations in the United States and around the world.



We coordinate the **National Notifiable Diseases Surveillance System (NNDSS)**, which allows a range of public health partners to share health information to prevent the occurrence and spread of diseases and other health and safety emergencies.



The **CDC Learning Connection** links more than 250,000 public health professionals from more than 200 countries with free, quality, accredited training resources from CDC, partners, and other organizations.

Protecting America's Health From One Century to the Next

Where We've Been, Where We Are, Where We're Going

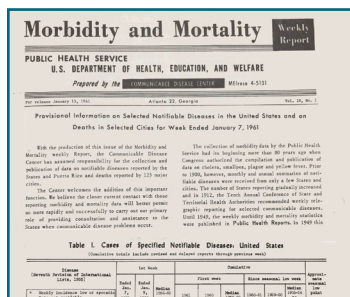
Although established as a center in October 1946, the seeds of the CSELS story are as old as CDC itself. Some of CDC's earliest flagship programs were focused on tracking and investigating disease outbreaks, mobilizing to protect the public during health threats, keeping the public informed about a health crisis, and training the professionals who do this work. These programs have been part of CDC in one form or another throughout its history.

In 2015, CSELS completed a reorganization that brought many of these historic programs together to function as a unified package. Combined with new programs that reflect the changing landscape of science and medicine, CSELS provides the support structure for much of our nation's health system.

Communicable Disease Center, or CDC, opens in downtown Atlanta, in the Volunteer Building on Peachtree Street. The center is focused on fighting malaria, typhus, and other communicable diseases.



CDC assumes publication of the **Morbidity and Mortality Weekly Report (MMWR)**—the “voice of CDC,” which publishes important data on death and disease from every state every week.



CDC begins using a computerized system for disease tracking—the **National Electronic Telecommunications System for Surveillance**. It provided weekly reports from across the nation.

CDC establishes the **Public Health Training Network (PHTN)** to educate the public health workforce. By 2003, it had reached more than 4.8 million users.

1946

1951

1961

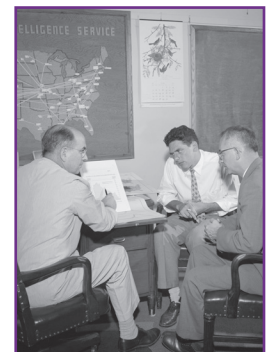
1972

1988

1990

1993

The **Epidemic Intelligence Service (EIS)** is established. It quickly becomes the nation's—and world's—on-call response team for a wide range of emergencies.



National disease-tracking systems begin. The first list of 41 nationally notifiable infectious diseases was developed at the first conference of state and territorial epidemiologists—the predecessor of the Council of State and Territorial Epidemiologists established in 1992.

CDC establishes its **Preventive Medicine Residency**.

The **Clinical Laboratory Improvement Amendments (CLIA)**—the law that governs all laboratory testing on people in the United States—is passed. CDC, FDA, and the Centers for Medicare & Medicaid Services begin their work to make sure regulations and guidelines for clinical laboratory tests keep up with laboratory medicine and information technology.



By act of Congress, the **Community Preventive Services Task Force** is formed to develop evidence-based guidance on community-based health promotion and disease prevention interventions. Their recommendations are published in *The Community Guide*.

CASPIR (CDC and ATSDR Specimen Packaging, Inventory, and Repository) is created to provide long-term storage for sample collections of current or foreseeable value to CDC and others.



CDC Vital Signs™ debuts with an issue on breast and colorectal cancer screening.

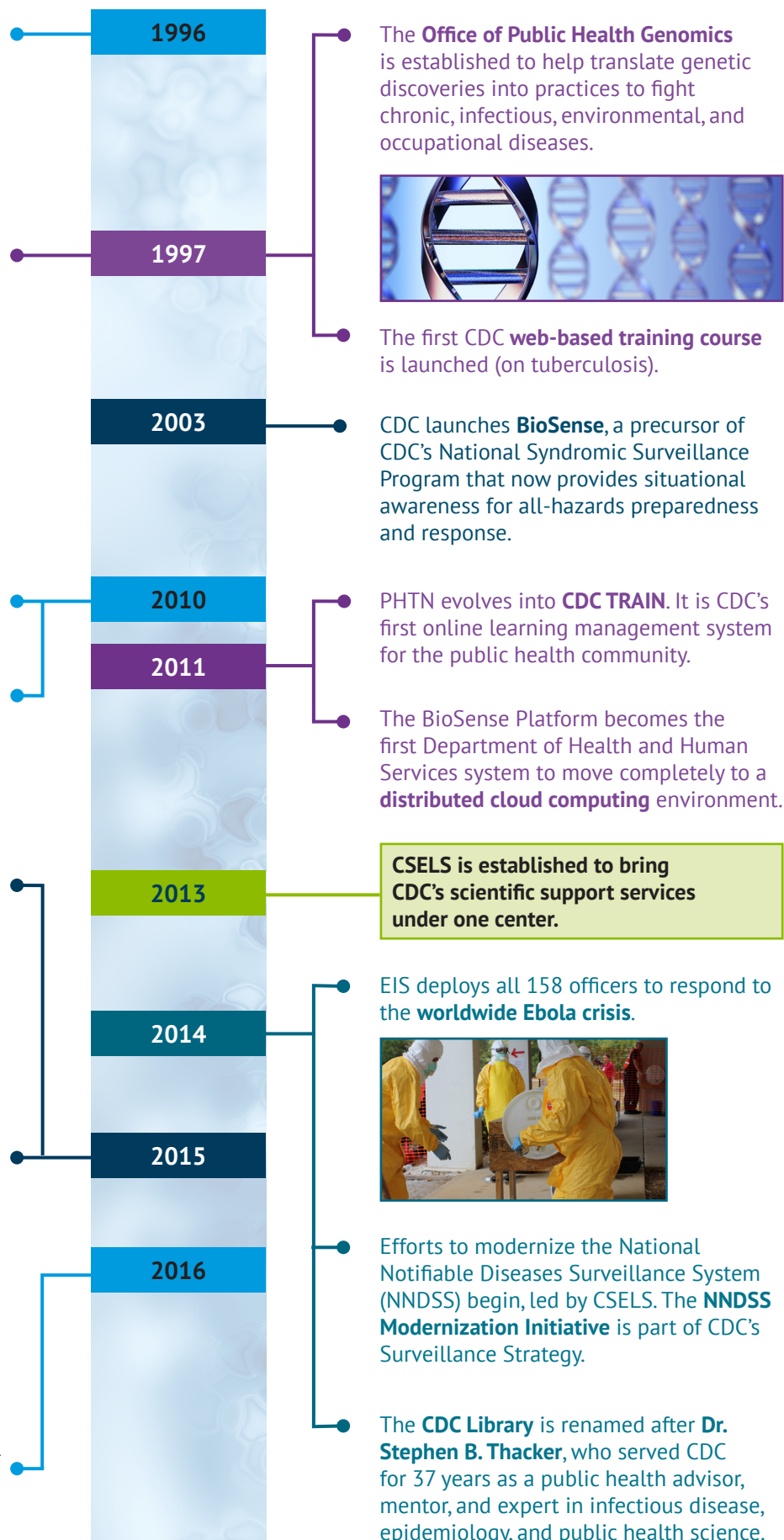
CDC opens the **Informatics Innovation Unit** (originally Informatics Research & Development Activity).

CSELS signs a memorandum of agreement with the Office of the Surgeon General to provide a fulltime medical officer or senior scientist to serve as the **editor-in-chief of *Public Health Reports***, the official journal of the U.S. Public Health Service.

Using the EIS model, CSELS launches the **Laboratory Leadership Service Fellowship** Program to train laboratory scientists in biosafety and laboratory management.



CSELS begins managing the **Surveillance Data Platform With Shared Services**, a virtual data sharing environment being developed as part of CDC's Surveillance Strategy.




Our Roadmap: The CSELS Strategic Framework



Our Mission
**To provide scientific
services to advance
public health**

The Strategic Framework is our roadmap for decision making, planning, policy, and communication efforts, and a lens through which our partners and stakeholders can see the full picture of our contribution to CDC's public health mission.

All CSELS activities are organized around the Strategic Framework to move us toward four overarching collective goals. It was developed using a "bottom up" approach, leveraging the strategic priorities of our four divisions as the foundational building blocks of our center's strategies and goals. Each division organizes its activities around its own set of fully defined priorities. The Strategic Framework is the center-wide umbrella we use to capture, articulate, and prioritize the mission-driven work being done across CSELS.



Goal 1.0
**Transform the
public health
system**

Strategy 1.1

Use the latest science and technology to produce quality data, products, and services

Strategy 1.2

Build and maintain public health systems and programs

1.1.1 Produce evidence-based tools, standards, guidelines, and strategies that promote public health science and practice

1.1.2 Modernize surveillance programs to ensure a timely response to public health threats

1.1.3 Provide access to sources and tools to expand the use of public health data

1.2.1 Optimize CDC specimen management health science and practice

1.2.2 Coordinate CDC's Surveillance Strategy

1.2.3 Enhance systems for data collection and exchange

Goal 2.0 Prepare the health workforce

Strategy 2.1

Develop operational and educational capacity

2.1.1 Provide leadership for national public health workforce efforts

2.1.2 Provide evidence-based workforce education, training, technical assistance, and professional development

2.1.3 Improve public health through workforce development activities

Goal 3.0 Target strategic partnerships

Strategy 3.1

Promote internal and external partnerships to increase public health impact

3.1.1 Engage partners to implement laboratory information products

3.1.2 Leverage partnerships to share information and resources that change public health practice

3.1.3 Collaborate with partners to make data available for decision making

3.1.4 Collaborate with partners to strengthen fellowships and training programs

Goal 4.0 Optimize operations

Strategy 4.1

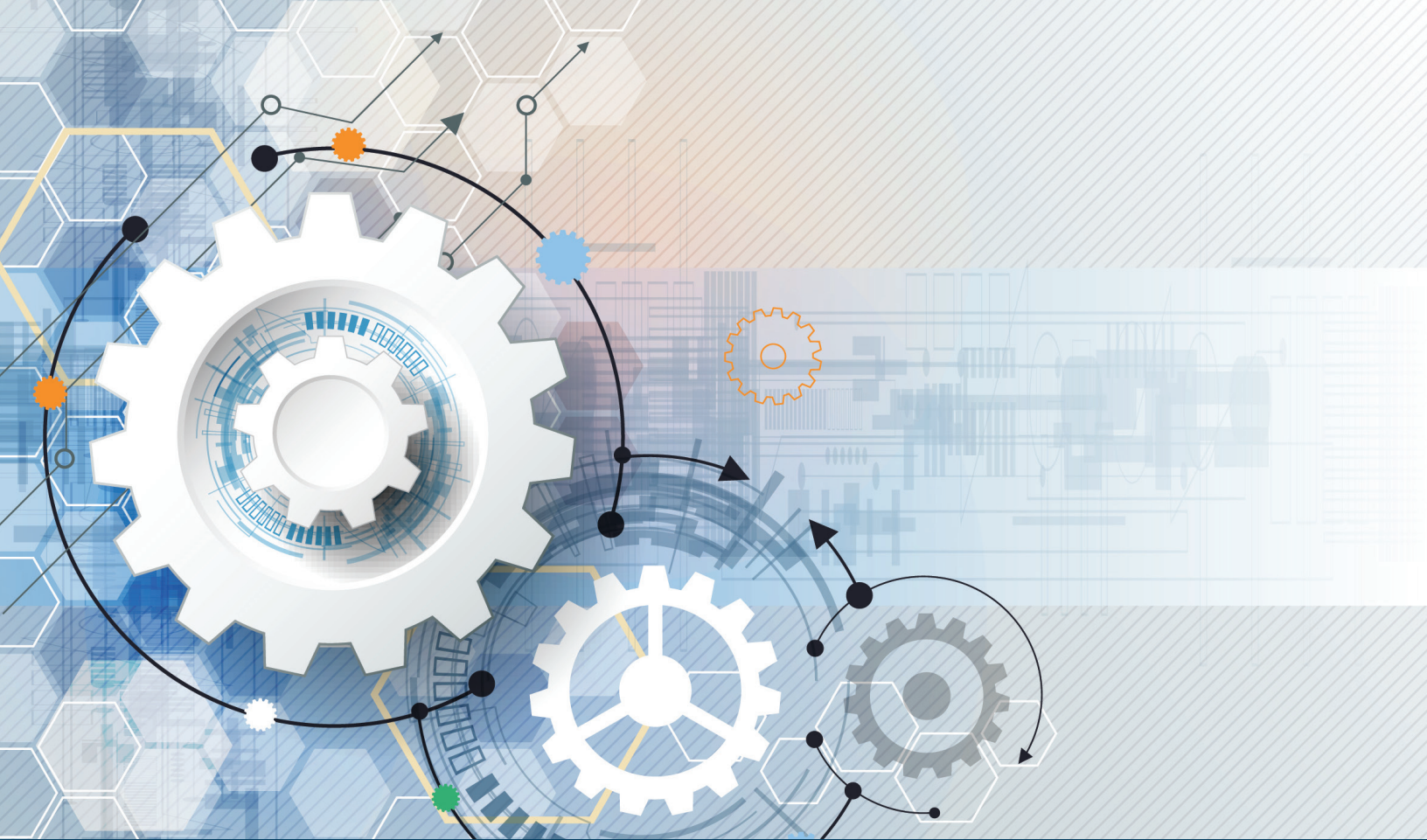
Manage the center's resources efficiently to maximize our impact

4.1.1 Recruit and retain strong, dynamic leaders and staff and support continuous workforce development

4.1.2 Align staff and resources with agency priorities and response needs


4.1.3 Improve internal program performance through exemplary business service and innovative practice

4.1.4 Enhance communication and policy action to expand reach, visibility, and impact



**Our Services.
Our Work.
Our Impact.**

The following pages highlight the work and accomplishments of the more than 30 programs spread across our 4 divisions and CSELS Office of the Director. Each profile in this section covers the goals and main activities of the program, the expert knowledge and skills the program contributes, and the successes, products, and innovations that show the program's unique contribution to its stakeholders and to the nation's overall public health.



The work of our programs is our Strategic Framework in action. This is where we are, where we've been, and where we're going into the future.



Health Informatics and Surveillance

Overview

Our Mission: To provide leadership and crosscutting support in developing public health information systems, managing public health surveillance programs, and providing health-related data required to monitor, control, and prevent the occurrence and spread of diseases and other adverse health conditions

Our Services

- Provide technical assistance for and access to **multiple data sources** that can be used for research, decision making, priority setting, program evaluation, and resource allocation.
- Develop **information systems** used by state and local health departments and CDC programs for data collection, exchange, and processing.
- Collaborate with state and local health departments to provide technical support for collecting, managing, and submitting data on **notifiable diseases and conditions**.
- Collaborate with other federal agencies, state and local health departments, and other organizations to support the timely exchange of **syndromic data and information** for nationwide situational awareness and enhanced response to hazardous events and disease outbreaks.



Our Programs

Data Hub

- Coordinates agency-wide data purchases and acquisitions.
- Establishes and maintains secure databases on the CDC network.
- Facilitates and tracks CDC data use agreements.
- Provides technical and scientific assistance to CDC users.
- Supports user networks for shared learning.
- Maintains a suite of flexible SAS tools.

Information Systems

- Track supplies during health emergencies.
- Provide mobile tools for assessing health threats.
- Support public health and other laboratories that test for biological and chemical agents linked to terrorism.
- Help transfer disease-tracking data efficiently and securely.
- Enable public health organizations to communicate with each other.

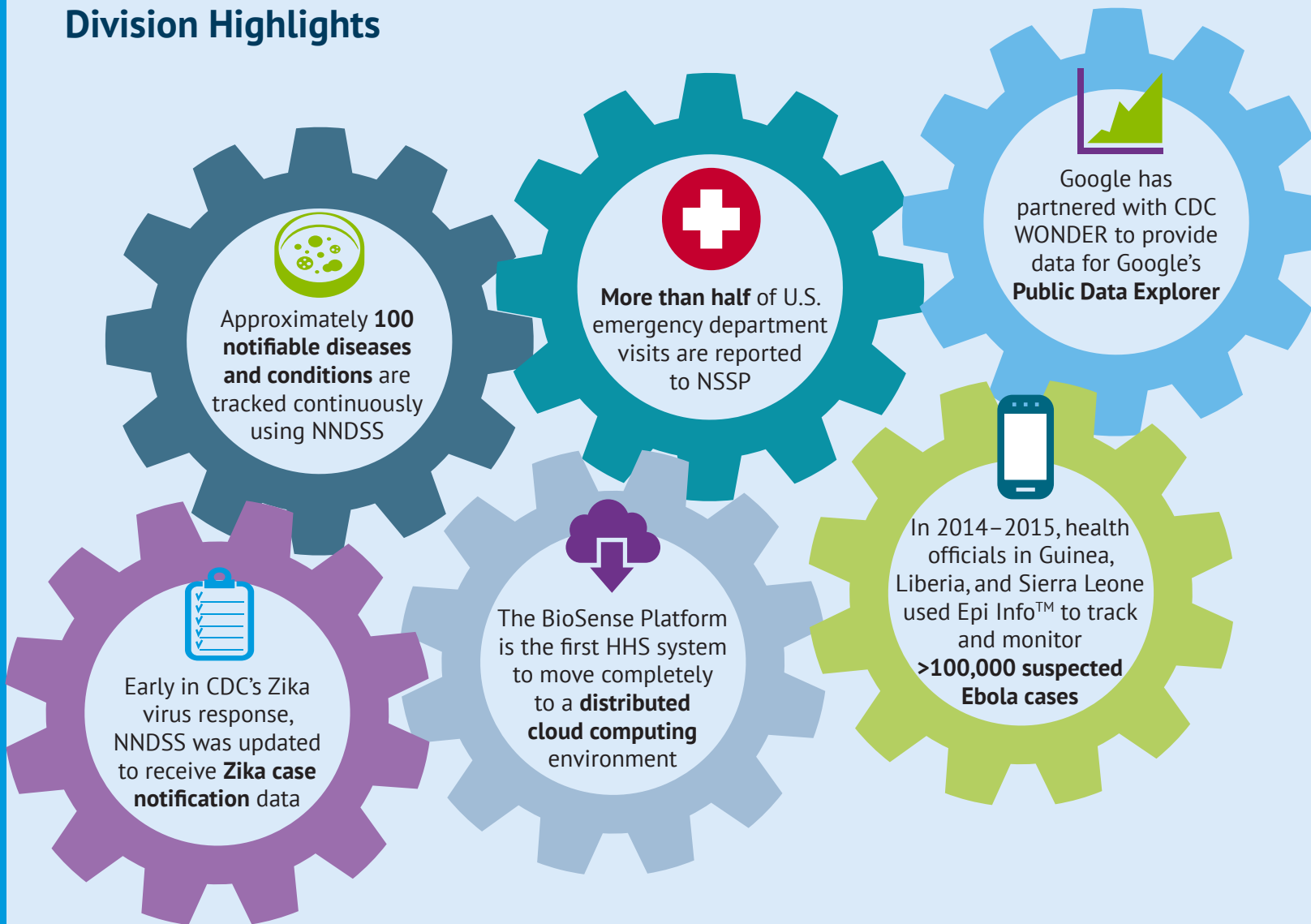
National Notifiable Diseases Surveillance System (NNDSS)

- Provides data on current disease patterns and outbreaks.
- Helps monitor regional and national trends in diseases and health conditions.

National Syndromic Surveillance Program (NSSP)

- Promotes and advances development of a system for the timely exchange of syndromic data, which come from healthcare settings such as emergency departments, hospitals, clinics, pharmacies, and laboratories.
- These data support situational awareness and emergency response.

Division Highlights



Moving Toward the Future

As part of the CDC Surveillance Strategy, we're leading efforts to modernize NNDSS and enhance NSSP so that

- The entire country will be using common national data exchange standards
- CDC programs will get more complete and timely data on notifiable diseases and conditions
- Syndromic data are timely and improve situational awareness and response to public health threats
- Federal, state, and local health agencies have access to powerful tools for analyzing and visualizing syndromic data.

Data Hub

We make **health-related data** available to CDC programs—as well as to the broader community of health professionals, researchers, and the public at large—to support **public health research and decision making**.



Our Services

Through centralized coordination and improved efficiencies, we provide access to a variety of resources, including

- **CDC WONDER (Wide-ranging Online Data for Epidemiologic Research)**, a web application connecting users with data to help conduct research, make decisions, set priorities, assess programs, and focus resources. CDC WONDER is available to state and local health departments, researchers, healthcare providers, CDC disease-tracking programs, and the general public.
- **American Hospital Association (AHA) data**, which include information from two sources. The **AHA Annual Survey of Hospitals** profiles more than 6,500 U.S. hospitals with information on organization and staffing, communities served, services provided, and expenses. The **AHA Healthcare IT Database** has information on the depth and level of technology integration in more than 3,400 hospitals.
- **Centers for Medicare & Medicaid Services clinical claims data**, which are valuable for CDC research on topics such as access to care, healthcare utilization and practices, disease burden, and health outcomes.
- **MarketScan**, a suite of databases and tools licensed from Truven Health Analytics that has information on healthcare insurance claims. MarketScan data allow researchers to explore complex problems in public health across time, such as health economics and treatment outcomes.
- **Healthcare Cost and Utilization Project (HCUP)**, a **national resource** on inpatient and outpatient care and emergency department visits. HCUP was developed through a partnership of federal and state agencies and commercial organizations and built from hospital administrative data. It's sponsored by the Agency for Healthcare Research and Quality (AHRQ).

Our Work

- Coordinate agency-wide data purchases and acquisitions.
- Establish and maintain databases that are housed securely on the CDC network.
- Facilitate and track data use agreements within CDC.
- Provide technical and scientific assistance to CDC users.
- Offer training to enhance users' skills.
- Support user networks to facilitate shared learning.
- Maintain a suite of flexible SAS tools.

Our Impact

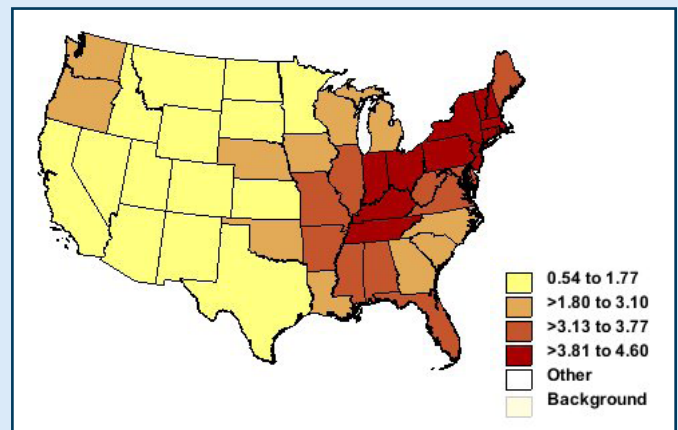
- **Access to timely information is crucial for public health research.** Data Hub's various databases have more than 470 total users. They are the primary sources for peer-reviewed publications, policy statements, and impact analysis studies by CDC programs, partners, and other researchers. For example, MarketScan data helped show that diabetes self-education programs—important for managing the disease and preventing complications—are underused even when health insurance pays for them. HCUP data helped researchers understand trends in hospital readmission for patients with heart or lung diseases.
- **Data Hub resources support data-driven decisions.** HCUP, for instance, enables researchers and policymakers to study how health care is practiced and how patients fare over time and at the national, regional, state, and community levels. AHA data are usually combined with information from the HCUP or CDC disease-tracking systems to see how certain hospital characteristics affect patients' health, like how often patients get hospital-acquired infections. Federal agencies and state and local health departments can use sound, evidence-based information like this to evaluate their own programs, set priorities, and determine how to focus their resources.
- **CDC WONDER makes finding and understanding data easier.** CDC WONDER's streamlined, menu-driven queries and reports connect users—both professional and the general public—with information on a wide variety of health topics including births, deaths, cancer diagnoses, HIV/AIDS, tuberculosis, sexually transmitted diseases, vaccinations, and environmental exposures. CDC WONDER can also create tables, maps, charts, data exports, and summary statistics; organize data results into categories; and compare data from different populations, locations, or groups of people.

Access CDC WONDER databases

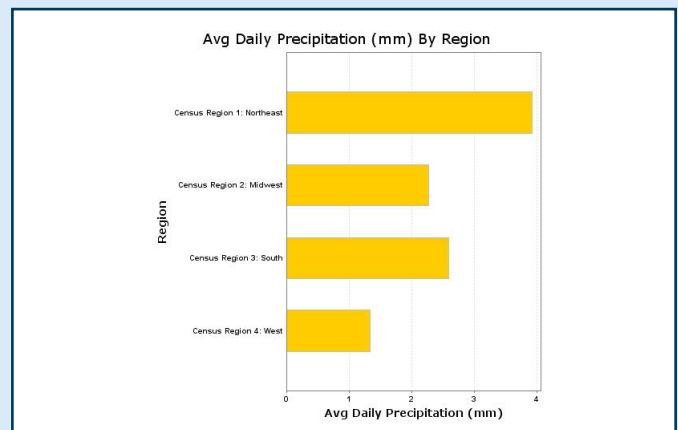
wonder.cdc.gov

Putting CDC WONDER to Use

Need to know how many heat wave days there were in your area last year? Or how much precipitation your community received on a particular day? Or how much particulate matter (a type of pollution) is in the air in your region? CDC WONDER's environmental exposure data can answer all these questions, compare the answers for different communities or years, and create maps and charts to make the information easy to understand.



An example of CDC WONDER's map-making tool, this image shows the average precipitation in the United States by state.



CDC WONDER also allows users to create tables and charts, like this one showing the average daily precipitation in the United States by region.

Information Systems

We operate crucial systems that give health officials access to information they need to protect against **disease outbreaks and other health threats**. Our systems reach CDC programs, state and local health departments, and state public health laboratories, as well as international public health officials.

Our Services

- Provide software to
 - ✓ Enhance the ability of federal, state, and local public health agencies to **track supplies**—such as drugs and vaccines—that are needed to respond to health emergencies
 - ✓ Enable public health practitioners around the world—even those who have limited network connectivity or only have access to mobile devices—to **assess health threats** during disease outbreaks, perform surveys, and generate maps that show clusters and trends in disease cases
 - ✓ Support a network of public health and other laboratories that **test for biological and chemical agents** linked to terrorism.
- Provide information systems that allow the efficient and **secure transfer of data**. Examples of these systems include the Message Validation, Processing, and Provisioning System; the Messaging System; and the National Electronic Disease Surveillance System (NEDSS) Base System.
- Operate a secure messaging platform to **enable public health organizations to communicate** with each other, regardless of the types of information systems they use.



At the beginning of 2016
Epi Info™ had more than
1 million users in
181 countries
with products translated into
13 different languages

Our Work

We build and operate five systems



- **Countermeasure Tracking Systems (CTS).** CTS consists of **three web-based computer applications** that give public health decision makers timely, accurate information about the supply, distribution, and use of countermeasures—medicines and other supplies used to help prevent or slow the spread of disease.
- **Epi Info™.** This publicly available suite of interoperable software tools—Epi Info for Windows, Epi Info for Mobile Devices, and Epi Info for Web & Cloud—provides the global community of public health practitioners and researchers with a **flexible, scalable, free toolkit** with multiple capabilities. Epi Info is used worldwide to rapidly assess disease outbreaks, or to develop small disease-tracking systems or ad hoc components for larger systems. Epi Info is also used for training public health professionals in epidemiology.
- **Laboratory Response Network Results Messenger (LRN RM) and Results Viewer (LRN RV).** This software provides LRN laboratories with the ability to **manage and share standard laboratory results data** securely with public health partners. Established in 1999, LRN is an integrated national and international network of more than 150 laboratories that can respond quickly to biological and chemical threats, including those related to terrorism. It includes federal, state, local, military, food-testing, environmental, and international laboratories.
- **NEDSS Base System.** This CDC-developed integrated information system helps state and local public health departments manage reportable disease data and send notifiable disease data to CDC. The system gives users a **tool to process, analyze, and share** the data they receive. It also helps them manage disease outbreaks and prepare data for geographic analysis.
- **Message Quality Framework (MQF), Messaging System (MS), and Vocabulary Access and Distribution System (VADS).** These tools help public health agencies **electronically exchange health data and information.** They make it possible for the many organizations that help protect the public's health to communicate with each other and exchange critical and sensitive data—despite their use of a wide variety of information systems. Organizations create messages composed of standard health information content and vocabulary and exchange them over a secure messaging platform.

Our Impact

- **We bring state-of-the-art information systems to hard-to-reach settings.** The Epi Info mobile application allows epidemiologists to collect and analyze data on smartphones or tablets to investigate disease outbreaks, respond to emergencies, or conduct research in settings with or without good IT infrastructure. In 2016, the Epi Info team provided technical support to CDC's Brazilian Field Epidemiology Training Program and the Brazil Ministry of Health. We helped develop and deploy the Epi Info 7 case-control study form used in the field for Zika virus investigation, and supported surveillance activities at Brazil's 2016 Olympic soccer venue.
- **Health information systems are critical for national security.** For example, after a Florida laboratory discovered that a specimen from a patient contained the bacterium that causes anthrax, LRN laboratories used the secure LRN RM and LRN RV software as they engaged in the subsequent investigation, conducting more than **1 million tests on 125,000 samples** before the investigation was completed.
- **Our tools help CDC and other public health agencies respond effectively to emergencies.** The CTS, for example, proved its value as an emergency response asset in 2009 during **CDC's H1N1 (swine flu) vaccination campaign** and again during the **2014–2015 Ebola response.** CDC used CTS components to assess vaccine availability, track vaccine dispensing, monitor supplies like respirators and surgical masks, and determine vaccination rates in at-risk populations—and to track travelers returning from Ebola-affected countries. In both instances, health officials were able to quickly evaluate the effectiveness of public health interventions.

National Notifiable Diseases Surveillance System (NNDSS)

NNDSS is a **nationwide collaboration** that enables all levels of public health—local, state, territorial, federal, and international—to **share information about notifiable diseases**. Information from NNDSS is used to monitor, control, and prevent the occurrence and spread of these infectious and noninfectious diseases and health conditions.

In January 2014, CDC began a multi-year **NNDSS Modernization Initiative**—part of the agency-wide Surveillance Strategy. CSELS is leading these efforts to update and strengthen the infrastructure supporting NNDSS. For example, the **Message Validation, Processing, and Provisioning System** software is being developed to improve how nationally notifiable disease case messages are sent to CDC and how they are processed and provided to CDC programs for analysis. The new software will enhance the system's ability to provide comprehensive, timely, and high-quality data for public health decision making.



Partners in the **NNDSS collaboration** include

- State and local jurisdictions
- CDC programs
- Council of State and Territorial Epidemiologists
- Association of State and Territorial Health Officials
- Association of Public Health Laboratories
- International health organizations.

Our Services

- Coordinate and provide data to **monitor diseases** and track how they spread.
- Provide data to CDC programs for tracking **regional and national trends** in diseases and health conditions.
- Lead the **NNDSS Modernization Initiative** by addressing data availability, system usability, and redundancies, and by incorporating new information technologies into the system.

Our Work

- **Support state and local health departments** in collecting, managing, and analyzing their data and in submitting case notification data to CDC for NNDSS. Support includes funding, health information exchange standards and frameworks, electronic health information systems, and technical support.
- **Receive, secure, and process** nationally notifiable disease data, and provide it to disease-specific CDC programs.
- **Work with other CDC programs** to prepare annual summaries of infectious and noninfectious diseases and conditions, which are published in the *Morbidity and Mortality Weekly Report (MMWR)*.

Our Impact

- **Surveillance is the foundation of public health practice.** To keep people safe, health professionals need to be aware of disease and other health threats facing the population. That's why systems like NNDSS are so important. It's a centralized way to collect, analyze, and use health data to see what's happening in our communities, our regions, and across the nation so we can identify and respond to disease trends and outbreaks as soon as possible.
- **NNDSS is vital to the national public health infrastructure.** It represents a partnership across the whole public health enterprise—including CDC, public health jurisdictions, and partner organizations. Disease surveillance begins at local, state, and territorial public health departments, where local laws and regulations require that cases of certain infectious and noninfectious diseases be reported. Health departments work with healthcare providers, laboratories, hospitals, and other partners to get the information needed to monitor, control, and prevent these conditions in their communities. Health departments also notify CDC about certain conditions so we can track them for the whole country.
- **Modernizing the system is critical to the nation's health.** The Modernization Initiative is making the technological infrastructure of NNDSS more robust. Based on standardized data and exchange mechanisms that work across all platforms, updates to NNDSS will improve notifiable disease data collection, sharing, and analysis across the entire public health community.

The history of NNDSS traces back to 1879, when Congress funded the collection and publication of reports on notifiable diseases such as cholera and smallpox. In 1961, CDC assumed responsibility for collecting and publishing data on nationally notifiable diseases and began to publish these data in the *MMWR*.



This photo from 1966 shows (left to right) Dr. Donald A. Henderson, Dr. J. Donald Millar, Dr. John J. Witte, and Dr. Leo Morris standing in one of CDC's former offices. They are discussing what may have been epidemiologic findings on the eradication of smallpox, an effort in which CDC played a central role.

All 50 states, the District of Columbia, New York City, and 5 territories provide critical data on more than **100 conditions of public health concern** through NNDSS

National Syndromic Surveillance Program (NSSP)

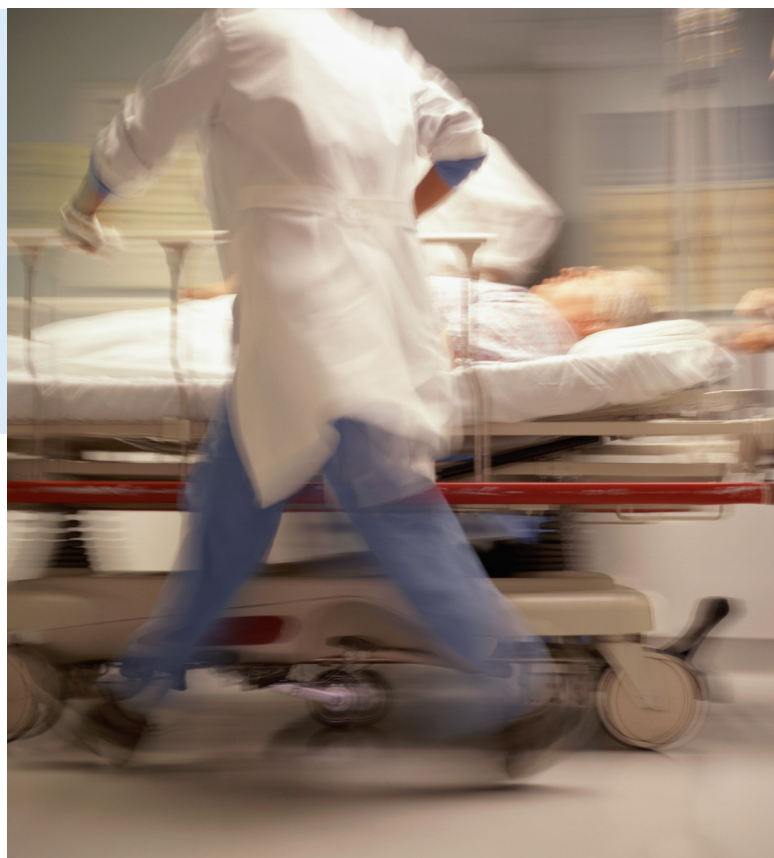
Syndromic surveillance is a type of disease tracking that uses near “real-time” data, mostly from emergency departments, to detect unusual activity for further investigation. It’s used to spot disease outbreaks or threats and to **improve situation awareness** for mass gatherings and public health emergencies. NSSP promotes and advances development of a **surveillance system for the timely exchange of syndromic information** to protect America’s health, safety, and security.

Our Services

- Promote a **community of practice (CoP)** in which participants collaborate to advance the methods and practice of syndromic surveillance.
- Support development, maintenance, and use of the cloud-based **BioSense Platform**—a secure integrated electronic health information system with standardized tools for quickly collecting, evaluating, storing, and sharing syndromic surveillance data.

Our Work

- **Fund ASTHO** to host the NSSP BioSense Platform.
- **Work with partners**, such as ASTHO, CSTE, NACCHO, and the International Society for Disease Surveillance, so NSSP BioSense Platform users can provide feedback on its use and development.
- **Support a CoP** that includes CDC-funded grantees, nonfunded states and jurisdictions that contribute data to BioSense, public health practitioners who use local syndromic surveillance systems, CDC programs, other federal agencies, partner organizations, hospitals, healthcare professionals, and universities.



NSSP works through collaboration with

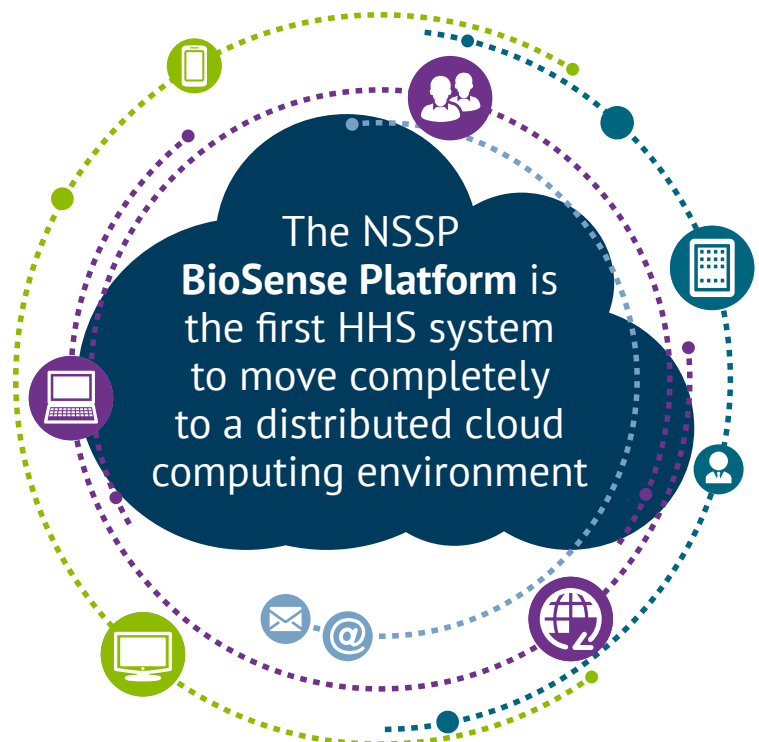
- Other federal agencies, such as the Department of Defense and Department of Veterans Affairs
- State and local health departments
- Hospitals, healthcare organizations, and health professionals
- Public health partner organizations, such as the National Association of County and City Health Officials (NACCHO), Association of State and Territorial Health Officials (ASTHO), and Council of State and Territorial Epidemiologists (CSTE).

Our Impact

- **Syndromic surveillance is an early warning system for our nation's health and security.** Syndromic surveillance supports emergency response by monitoring outbreaks, injuries, unusual health conditions not found by other systems, and other health conditions associated with natural or manmade disasters such as hurricanes, wildfires, oil spills, or terrorist attacks. Ongoing monitoring during emergency response helps officials decide what resources are needed and how well the response is helping the community recover from the event. Ongoing tracking of an event can also provide reassurance that a large-scale outbreak is not occurring.
- **Real-time tracking can inform decision making during public health emergencies.** Through BioSense, NSSP connects CDC programs with state and local syndromic surveillance data to help track and respond to health threats. In 2014, for example, NSSP brokered relationships with Texas public health officials to give CDC's Office of Public Health Preparedness and Response access to local syndromic surveillance data to assess an Ebola surge in hospitals. In 2015, NSSP provided CDC with local surveillance data on opioid overdose, unintentional marijuana ingestion by children, and enterovirus D68 infection.
- **A shared infrastructure helps state and local health departments better recognize and respond to potential threats.** BioSense gives health departments a common electronic platform for collecting, storing, and sharing syndromic surveillance data. Cloud computing provides a shared pool of resources—networks, servers, software, and other electronic tools—that allows agencies to work more efficiently, reduce costs, and share information quickly across city, county, or state lines. This shared infrastructure also helps expand the use of electronic health records.



Syndromic surveillance isn't just for emergency response. It can also detect **unusual increases** in injuries, drownings, drug overdoses, and chronic conditions such as asthma. Syndromic surveillance has been used to monitor **healthcare use**, including medication refills. Public health officials routinely use syndromic surveillance for **situational awareness** to monitor **outbreaks or injuries** during mass gatherings like the Super Bowl or major conventions. These data help public health officials respond to **ongoing health threats** in their communities.





A CDC laboratory worker enters information into an influenza database in the 1980s. Tracking data on the location and spread of diseases is critical for healthcare providers on the front lines of treatment and for epidemiologists who look for ways to stop the disease. Computerized disease tracking began in 1990. Today, CSELS leads CDC's efforts to modernize this tracking system.



Laboratory Systems

Overview

Our Mission: To strengthen the nation's clinical and public health laboratory system by continually improving quality and safety, informatics and data science, and workforce competency

Our Work

- **Quality and safety.** Improve the quality and safety of public health and clinical laboratory science and practice.
- **Informatics and data science.** Strengthen interoperability and the application of laboratory data and information systems.
- **Training and workforce development.** Enhance the competency and sustainability of the public health and clinical laboratory workforces.
- **Biorepository science.** Promote excellence in biorepository science to advance population health, patient care, and research.

Our Services

- Execute federal responsibilities for managing the **Clinical Laboratory Improvement Amendments (CLIA) program** in partnership with the Centers for Medicare & Medicaid Services and FDA.
- Develop and evaluate **standards, guidelines, and recommendations** to improve laboratory quality and safety across the nation.
- **Support the advancement of health IT standards**—such as harmonizing laboratory testing codes (e.g., LOINC, SNOMED CT)—to enable meaningful comparison of results worldwide.
- Implement informatics and data science approaches to evaluate laboratory practices and improve **access to and analysis of laboratory information** that supports clinical and public health outcomes.
- Provide reliable **biorepository services** to CDC scientists and collaborators to manage valuable specimen collections and reference materials.

Our Programs

Biorepository Science and Services

- CDC and ATSDR Specimen Packaging, Inventory, and Repository (CASPIR)
- CASPIR Advisory Committee
- CDC Specimen Policy Board
- CDC specimen and collections policies
- Genetic Testing Reference Material Coordination Program (GeT-RM)

Clinical Laboratory Improvement Program

- Clinical Laboratory Improvement Amendments (CLIA) program
- Clinical Laboratory Improvement Advisory Committee (CLIAC)
- Laboratory Medicine Best Practices Initiative (LMBP™)
- Clinical Laboratory Integration into Healthcare Collaborative (CLIHCTM)

Informatics and Data Science

- Laboratory Health Information Technology (LabHIT)
- Public Health Laboratory System Database (PHLSD)
- Laboratory Informatics Self-Assessment Tool
- Applied research of laboratory systems and databases

Training and Workforce Development

- Laboratory training resource development and evaluation
- Laboratory competencies and fellowship support

- Develop, deliver, and evaluate laboratory quality, safety, and informatics training and resources to enhance **laboratory workforce competencies**.
- Improve the **effectiveness and sustainability** of state and local public health laboratories by developing shared systems, fostering regional and national coordination of systems, and supporting collective improvement of testing services.

Division Highlights—FY2016



First to publish quality guidelines for **next generation sequencing**



CASPIR manages more than **6.5 million** specimens, nearly half of all specimens at CDC



Provided **302** training activities on **98** laboratory topics totalling **39,224** training hours



Disseminated more than **13,000** quality and safety guidelines and educational products



Implemented more than **100** CLIAC recommendations

Partnering for Success

CDC continues to improve the safety and quality of laboratory practice nationally by partnering with stakeholders such as

- ✓ American Association for Clinical Chemistry
- ✓ American Clinical Laboratory Association
- ✓ American Society for Clinical Laboratory Science
- ✓ American Society for Clinical Pathology
- ✓ American Society for Microbiology
- ✓ Association for Molecular Pathology
- ✓ Association for Pathology Informatics
- ✓ Association of Public Health Laboratories
- ✓ Clinical Laboratory Management Association
- ✓ Clinical and Laboratory Standards Institute
- ✓ College of American Pathologists
- ✓ Institute of Medicine
- ✓ The Joint Commission
- ✓ Federal agencies
- ✓ Hospital, academic, and commercial laboratories
- ✓ Laboratory accrediting bodies
- ✓ State and local health departments
- ✓ Standards organizations
- ✓ Test system manufacturers and software developers

Continuum of Science to Practice



Biorepository Science and Services

We operate the **CDC and Agency for Toxic Substances and Disease Registry (ATSDR) Specimen Packaging, Inventory, and Repository (CASPIR)**—CDC’s centralized specimen biorepository—which preserves valuable specimen collections, including those from historical studies, outbreak investigations, and emergency responses. We help develop and support implementation of CDC’s specimen-related policies and work in partnership with its Specimen Policy Board and the CASPIR Advisory Committee to ensure compliance with guidelines and policies.

In partnership with the National Institutes of Health (NIH) Coriell Biorepository, we coordinate efforts for the genetic testing community to **contribute, develop, and characterize reference materials** that are needed to ensure accuracy of laboratory test results.

Our Services

- Operate CASPIR and protect the integrity of specimen collections in accordance with **best practice guidelines** for biorepository science.
- Help develop and implement **CDC policies**: CDC Specimen and Sample Management policy, Collections Access policy, and CASPIR policy.
- Offer reliable **biorepository services** to CDC laboratories, such as aliquoting, specimen retrieval, specimen package preparation, and specimen transport.
- Use CASPIR’s customized **Specimen Inventory Management System (SIMS-LV)** to manage data and specimen inventories.
- Provide blocks of **specimen identifiers** to CDC centers, institutes, and offices for uniquely identifying all specimens within the agency and for specimen tracking.
- Procure **general commodities** for CDC facilities, such as labels, dry ice, and gases.
- Maintain **liquid nitrogen tank** storage rooms on multiple CDC campuses.
- Assess the **efficiency of operations** through ongoing evaluation and innovation of our services and technical support.
- Characterize **genomic DNA reference materials** for genetic disorders, pharmacogenetics, molecular cancer diagnostic tests, and next generation sequencing, and make them available through public repositories.



Our Impact

- **We provide a controlled, uniform environment to preserve CDC's unique specimens.** Maintaining the integrity of specimens is important for future uses, such as research and development of new tests, vaccines, and treatments.
- **Our specimens play crucial and historical roles in public health research and population health.** CASPIR supports national studies, such as the National Health and Nutrition Examination Survey, the Active Bacterial Core Surveillance Program, and the Child Health and Mortality Prevention Surveillance Network.
- **We publicize the availability of characterized genetic reference materials.** Papers are published in scientific journals, presented at scientific meetings, and posted on CDC and other websites.
- **We provide tools to assess the quality of human genome sequencing.** We collaborated with NIH's National Center for Biotechnology Information and partners in the genetic testing community to create the GeT-RM Browser. This web portal lets laboratories compare their genome sequencing test results with highly characterized reference materials to determine whether they have accurately generated a DNA sequence.
- **We have amassed a large inventory of samples to support genetic testing.** These reference materials—available through Coriell—are used by clinical laboratories, research laboratories, and test developers nationwide to improve the quality and availability of genetic testing and to develop new tests.

CASPIR has more than **200 tanks for liquid nitrogen** storage as well as dozens of mechanical freezers that provide secure long-term preservation.

CASPIR currently manages more than **6.5 million biological and environmental specimens**, representing 620 collections from 33 different CDC divisions.



GeT-RM has characterized more than **6,000 genetic targets** in more than **600 human cell lines**

Find data sets on the GeT-RM Browser
www.ncbi.nlm.nih.gov/variation/tools/get-rm

Find more information on GeT-RM activities
wwwn.cdc.gov/clia/Resources/GetRM

Clinical Laboratory Improvement Program

Through our work with other CDC programs, federal and state agencies, professional societies, and international organizations, we support the development and adoption of standards, guidelines, recommendations, and tools for improved quality and safety in clinical and public health laboratories. In collaboration with the Centers for Medicare & Medicaid Services (CMS) and FDA, we implement the **Clinical Laboratory Improvement Amendments (CLIA)**, which governs all healthcare-related laboratory testing performed on people in the United States.



Our Services

- Through the Clinical Laboratory Integration into Healthcare Collaborative (CLIHCTM), study identified gaps and develop solutions to optimize the **effective use of laboratory services** for better patient care.
- Conduct evidence-based systematic reviews using the **Laboratory Medicine Best Practices Initiative (LMBPTM) A-6 Method**, and work with experts to develop best practice guidelines for various laboratory testing areas.
- Collaborate with CMS, FDA, and other partners to develop **regulatory standards and guidelines** to implement and support CLIA regulations.
- Manage and support the **Clinical Laboratory Improvement Advisory Committee (CLIAC)**, a federal advisory committee that provides independent scientific guidance on improving laboratory quality and safety practices.
- Evaluate **proficiency testing programs** for CLIA compliance and provide expert recommendations for practical improvement.
- Assess **cytology laboratory practices** to assure quality of testing and practices.
- Enable and support **collaborations with federal partners and other stakeholders** to exchange information about laboratory practices.
- Monitor technological innovations and assess the effectiveness of laboratory practices and **national regulations and voluntary guidelines**.
- Help CDC **CLIA-certified laboratories** interpret CLIA regulations, and facilitate communications with CMS on CLIA-related laboratory testing.

Our Impact

- **Scientific input drives effective regulation.** CLIAC has addressed issues that have faced the national laboratory and healthcare communities for more than 20 years. The committee's insights have resulted in more than 100 formal recommendations as well as many changes to regulations, revisions in policy, development of educational materials, and studies to assess the impact of the CLIA program.
- **We forge new collaborative efforts to unite diverse fields and develop quality standards for emerging technologies.** In 2012 and 2015, we led two national workgroups to develop consensus guidance for next generation sequencing. Prior to our involvement, there were no standards for how to use this new technology in clinical settings.
- **We pioneer effective processes for developing systematic reviews and evidence-based recommendations.** For example, the LMBP defined the A-6 Method—the only evidence-based process to systematically identify laboratory quality improvement practices.
- **We help set national laboratory standards.** Between 2012 and 2016, we contributed to more than 30 published national or international standards and guidelines that address laboratory quality and safety needs. These include specific laboratory testing areas, such as cancer diagnostics, genetic testing, and microbiology testing, among others.

As of 2016



CLIA covers nearly
255,000 U.S. laboratories



More than **11 billion**
clinical laboratory tests are
performed in the United
States each year



About **328,000** diagnostic
laboratory professionals
use CLIA-related guidance
and resources



Find out more about CLIA and CLIAC

wwwn.cdc.gov/CLIA

wwwn.cdc.gov/cliac

Find out more about CLIHC and LMBP

www.cdc.gov/ophss/csels/dls/eblm/index.html#CLIHC

wwwn.cdc.gov/futurelabmedicine



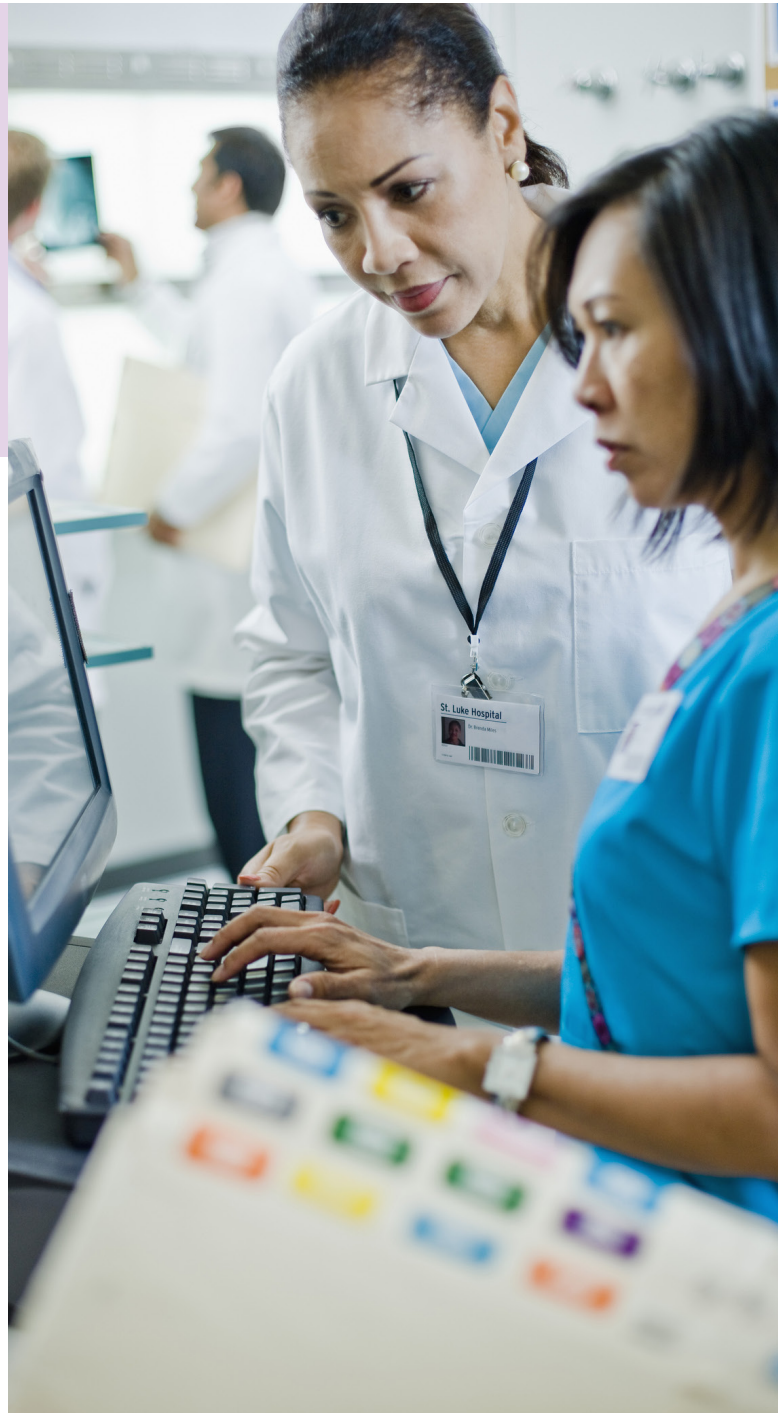
We surveyed **1,700 primary care physicians** nationwide and characterized their challenges when ordering and interpreting laboratory tests. The survey results informed the CLIHC agenda and development of tools such as the **PTT Advisor app**.

Informatics and Data Science

We develop, implement, and evaluate informatics and data science approaches to strengthen laboratory information systems for improved clinical and public health outcomes. Our work includes regional and national systems coordination, reporting of laboratory diagnostic information to electronic health records (EHRs), decision-making tools for healthcare providers, research and application of laboratory-related data, and informatics solutions for improved laboratory management, practice, and emergency preparedness.

Our Services

- Improve the collection, maintenance, research, and application of data from **national laboratory systems** and other large health databases such as **medical data warehouses**.
- Provide leadership and coordination for improving the management of **laboratory information systems**.
- Advance **laboratory health information technology (LabHIT)** by working with laboratory and health informatics professionals and other stakeholders to develop national **standards, policies, and certification requirements** for EHRs and the evolving health IT structure.
- Support **interoperable health IT standards**, such as harmonizing laboratory testing codes (e.g., LOINC, SNOMED CT) to enable meaningful comparison of results worldwide.
- Enhance access, analysis, and sharing of information about laboratory services and capacity nationwide through the **Public Health Laboratory System Database (PHLSD)** and the **Informatics Self-Assessment Tool**.



Our Impact

- **Laboratory services are a critical component of health IT.** Accurate, expedient, and user-friendly integration of laboratory diagnostic results into EHRs helps ensure quality patient care and treatment.
- **Our work bridges gaps and encourages collaboration.** We work with teams across CDC, FDA, the Centers for Medicare & Medicaid Services, the Office of the National Coordinator for Health Information Technology, and HL7 to provide subject matter expertise and build consensus. Topics include the development of standardized vocabulary, semantic operability of laboratory test coding, certification of EHR modules, inclusion of CLIA requirements, and laboratory accreditation standards.
- **We communicate the value of laboratory health IT.** Our website provides information and professional guidance on the exchange of test results between EHRs and laboratory information systems to support patient safety. Through research and case studies, we show the significance of laboratory data-related interoperability and propose focus areas for action.
- **We develop groundbreaking tools.** The PHLSD will form the basis of a first-ever online national directory of public health laboratory services. Health departments will be able to immediately direct samples to laboratories that can run the tests needed. Our web-based Informatics Self-Assessment Tool provides the first available data on the informatics capacity of public health laboratories nationwide. It also offers a suite of tools for comparison and analysis from the national to organizational level.
- **Our products provide real solutions using current technologies.** We designed the partial thromboplastin time (PTT) Advisor app, an innovative mobile application that helps clinicians select the right follow-up tests for patients with blood clotting disorders.
- **We stimulate more nimble regional and national systems coordination.** Through partnership with the Association of Public Health Laboratories, we bring attention to systemic efficiencies and sustainability around cross-jurisdictional sharing of laboratory services, informatics capability, innovative practices, and collective workforce development.



Unconventional Results Display: Delayed Diagnosis and Treatment

A young woman's **abnormal Pap smear results** went undetected for four years because of a usability issue with her physician's EHR system. Because of a default setting, the system showed the physician the patient's previously normal laboratory result, and the more recent abnormal result went unnoticed.

The young woman's advanced cervical cancer was only detected when she sought treatment for other symptoms that had developed. As a result of the delay in diagnosis and treatment, the young woman had a hysterectomy. The LabHIT team is working with other federal agencies and its partners in the laboratory and health IT communities to ensure **preventable errors** like this do not occur.

Source: Sawchuk M, Linville M, Cornish N, Pollock A, Lubin I, Gagnon M, et al. The essential role of laboratory professionals: ensuring the safety and effectiveness of laboratory data in electronic health record systems. Atlanta, GA: Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention; 2014.

Find more information on LabHIT

www.cdc.gov/labhit

Learn more about the PTT Advisor app

itunes.apple.com/us/app/ptt-advisor/id537989131?mt=8

www.cdc.gov/ophss/csels/dls/eblm/index.html#CLHC

Download the PDF version of the Informatics Self-Assessment Tool

www.aphl.org/MRC/Documents/LEI_2013Jun_Informatics-Self-Assessment-Tool-for-PHLs.pdf

Training and Workforce Development

We provide leadership and support to enhance the clinical and public health laboratory workforce through initiatives that strengthen recruitment, retention, management, and training. Our trainings help scientists combat emerging threats, learn evolving practices, and stay current with the newest standards and technologies. We also develop frameworks, models, and resources that support laboratory-related competencies for fellowships and health science education.

Our Services

- Apply instructional design support and knowledge of adult learning best practices to help more than 60 CDC laboratories and external partners develop **effective training products**—to maintain a competent, prepared, and sustainable national and global laboratory workforce.
- Provide competency-building content across **nearly 100 laboratory topics** to keep CDC, public health, and laboratory scientists proficient in areas such as essential laboratory methodologies, new test procedures, informatics, and quality and safety.
- Design **innovative, comprehensive, and convenient training programs** featuring state-of-the-art video and graphics production in a variety of formats, including workbooks, hands-on workshops, e-learning, webinars, virtual classrooms, and smartphone apps.
- Help develop and promote **laboratory workforce competencies** through a national workforce strategic plan and the implementation of public health laboratory competency guidelines.
- Evaluate the efficiency and effectiveness of public health laboratory education and training, including measuring outcomes on the **transfer of knowledge and skills to improved laboratory practice**.



Our Impact

- **Our products and programs address competency gaps for laboratory professionals and healthcare providers.** These resources help improve on laboratory and point-of-care testing practices. Our *Ready? Set? Test!* booklets, posters, postcards, and online training course help laboratories and other testing facilities meet Clinical Laboratory Improvement Amendments (CLIA) regulations and follow recommended guidelines.
- **Our training programs help laboratories improve their safety and quality of practice.** Over half of our training participants have reported implementing new or improved laboratory procedures as a result of the training. More than 75% of our biosafety and biosecurity training attendees implemented changes in their facilities' programs.
- **We inform national laboratory capacity for emergency preparedness and response.** In 2015, we successfully conducted the first Virtual Knowledge Assessment for Sentinel Laboratories—a group of several thousand local clinical laboratories that serve as the frontline response to biological threats in support of the Laboratory Response Network. Our assessments—offered at no cost to the local laboratories—cover rule-out-or-refer procedures to identify potential bioterrorism agents.
- **We publish work to impact the broad laboratory community.** In May 2015, together with the Association of Public Health Laboratories (APHL), we published Competency Guidelines for Public Health Laboratory Professionals as a *Morbidity and Mortality Weekly Report Supplement* issue. The guidelines inform training and curriculum development, fellowship programs, and management processes across public health and clinical laboratory systems.



Educational Tools Help Laboratories Continually Improve

We develop and disseminate a growing inventory of educational resources, including online courses, e-learning tools, web-based resources, and print materials. Here are some examples



More than 4,400 people have completed our *Ready? Set? Test!* online training course on preparing and performing waived testing. Our **booklets, posters, and postcards** have reached laboratories in 50 states and the District of Columbia.



Our workbook to help laboratories implement individualized **quality control plans** received more than 3,000 web page views in the first 3 months after launch.



People in the United States and 11 other countries have registered for our online **continuing education course** on good laboratory practices for molecular genetic testing.



Download the CDC/APHL Competency Guidelines for Public Health Laboratory Professionals

www.cdc.gov/mmwr/preview/ind2015_su.html

Find more information on laboratory training

www.cdc.gov/labtraining




CDC scientist Dr. J.V. Lange wears a maximum containment suit to handle dangerous specimens in one of CDC's early containment laboratories, also known as biosafety level 4 environments. Scientists who work in these laboratories must use highly specialized protective equipment such as these airtight suits. CSELS helps develop the standards and guidelines that address laboratory quality and safety nationally and internationally.



Public Health Information Dissemination

Overview



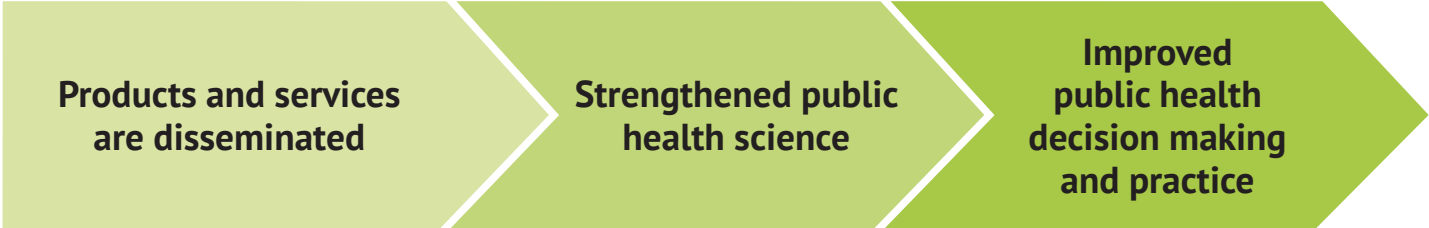
Our Mission: To strengthen public health science and improve public health decision making and practice to achieve positive health outcomes

Our Services

Clinicians, public health professionals, policymakers, communities, and individuals need timely, accurate information to make decisions to maintain and improve health. We meet that need with tools that improve public health decision making at all levels.

Our Programs and Activities

- *CDC Vital Signs™*
- The Community Guide
- Informatics Innovations Unit (IIU)
- *Morbidity and Mortality Weekly Report (MMWR)* Series
- Office of Public Health Genomics
- Stephen B. Thacker CDC Library



**Products and services
are disseminated**

**Strengthened public
health science**

**Improved
public health
decision making
and practice**

Our Work

- **Contribute to the evidence base** for improving public health.
- **Share timely, credible public health science** by developing and deploying innovative products, tools, and strategies.
- **Use proven strategies** to increase use of division products and services by our CDC colleagues, public health professionals, and healthcare providers.
- **Evaluate the impact** of our products and services.

Division Highlights

Our programs have a broad and diverse reach.



The CDC Library provided access to more than **1 million** electronic article downloads in FY2015



CDC Vital Signs™ had a total electronic reach of more than **6.6 million** exposures in FY2015



MMWR's electronic media reach was more than **23 million** in FY2016—up 3% since FY2014

Our programs support crucial CDC-wide activities.



Since September 2014, *MMWR* has published **80 reports** on Ebola and the public health response



We have leveraged **federal partnerships** to expand access to library resources at state health departments



Community Preventive Services Task Force recommendations inform CDC's initiative to drive **healthcare system transformation**

Moving Toward the Future

We will continue supporting the nation's ability to respond rapidly and efficiently to disease outbreaks, natural disasters, and other health threats by

- **Enhancing *MMWR*** to meet the needs of current users and the next generation
- **Supporting national initiatives** to link health care and public health and to accelerate healthcare transformation
- **Strengthening traditional and nontraditional partnerships** to increase use, and therefore impact, of our products
- **Strengthening an evaluation infrastructure** to assess and continuously improve our work.

CDC Vital Signs™

Each month **CDC Vital Signs** shines a spotlight on some of the most important health issues facing Americans today. Each issue—published as a technical report in CDC's flagship journal, *Morbidity and Mortality Weekly Report (MMWR)*, and in lay language in other formats—calls the nation to action. It documents where we stand now and what we can do to improve the public's health.

Our Services

Each monthly issue of *CDC Vital Signs* includes

- A **scientific article** published in *MMWR*, written by subject matter experts at CDC
- A printable, **plain language fact sheet** with infographics and detailed recommendations for stakeholders, written by scientific, policy, and communications experts in each field
- More than **20 communication products** each month, many in English and Spanish. These include web-based podcasts, webinars, buttons and badges, digital press kits, infographics, and links to the science behind the issue
- A **systematic outreach strategy** that includes media briefings by CDC leadership, letters to members of Congress, outreach to medical partners and critically important nonprofit organizations, and widespread distribution on social media channels.

CDC Vital Signs releases separate material written for different audiences—**scientists**, who need more technical details, and the **general public** and other **stakeholders**, who need more easily understandable information for action.

CDC Vital signs™



Our Impact

- **CDC Vital Signs reports each month on high-priority topics affecting the public's health.** Each issue describes the problem and offers concrete steps to address it—steps that can be taken by a variety of audiences. Readers report they use it to
 - ✓ Improve their understanding of an issue
 - ✓ Inform and implement programs for their constituents
 - ✓ Influence policy at the local, regional, or state level
 - ✓ Find timely recommendations that improve the health of those in their care.
- **Our products are award-winning.** *CDC Vital Signs* won the Secretary of Health and Human Services' **HHS Innovates Award in 2011**—its first year of production. It has also won **national communications awards** for clarity and plain language and **CDC and Agency for Toxic Substances and Disease Registry (ATSDR) Honor Awards**, including the Director's Award for Public Health Impact, Health Equity Award, Plain Writing Act Award, and Excellence in Quantitative Sciences.
- **The nation is paying attention.** In FY2015, total electronic reach was more than **6 million potential views** from traffic to the *CDC Vital Signs* website, social media followers, and electronic subscribers.



Each month's *CDC Vital Signs* includes an **MMWR article**. A bibliography on the subject is published in the CDC Library's **Science Clips digest**. Calls to action are based on recommendations from the Community Preventive Services Task Force when available.

Who We Reach

CDC Vital Signs reaches the audiences that are important voices in public health.

The National Media



From 2011 to 2015, an average of about **750 news stories** and **\$1.5 million in earned media value** occurred for each issue. Individual topics are regularly featured in *The Wall Street Journal*, *The Washington Post*, *The New York Times*, *Los Angeles Times*, *USA Today*, National Public Radio, and other national network news channels.

Decision Makers



CDC Vital Signs material has been presented to the **U.S. Senate** and the **U.S. Surgeon General**.

Healthcare Providers



Featured by major medical organizations, websites, and journals, information from *CDC Vital Signs* reaches **millions** of doctors, nurses, nurse practitioners, physician assistants, pharmacists, and others.

State and Local Health Departments



A 2012 evaluation showed that approximately **75% of health departments** knew about *CDC Vital Signs*. Half of them used it to improve their understanding of a health-related topic, and about 20% used it to develop and implement local programs.

The Community Guide

We support the work of the **Community Preventive Services Task Force (Task Force)** by sharing information on what works to improve public health. Task Force recommendations and other findings are compiled in *The Community Guide* to help inform the decision making of federal, state, and local health departments, other government agencies, communities, healthcare providers, employers, schools, and research organizations.



The Community Guide

Our Services

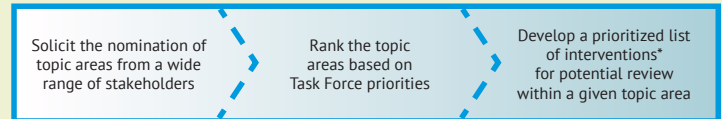
- **Conduct systematic reviews.** Task Force recommendations and other findings are based on systematic reviews. We manage more than **220 Task Force findings and related systematic reviews** across more than **20 topic areas** and refine the methods and processes for conducting quality and useful systematic reviews.
- **Share evidence-based results.** We help stakeholders use the recommendations and other findings in *The Community Guide* by **conducting webinars, providing direct technical assistance, and maintaining a website** that tailors information to each user, offers support in assessing and implementing Task Force recommendations, and enables users to share information with and learn from each other. The branch provides program management, operations support, and communication to help coordinate and disseminate Task Force findings and recommendations.



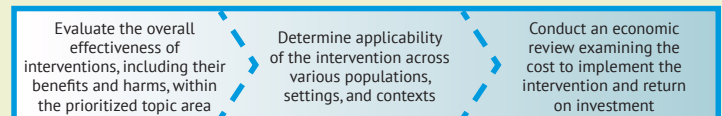
Community
Preventive Services
Task Force

The Community Guide Systematic Review Process

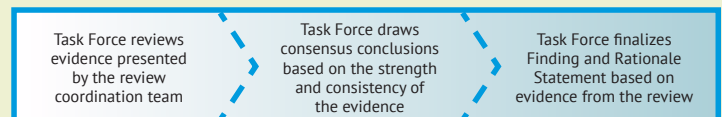
Prioritize Topic Areas for Review



Conduct Evidence-Based Intervention Review



Community Preventive Services Task Force Makes Recommendation



*Interventions refer to programs, services, and policies.

Our Impact

■ Task Force recommendations and other findings inform national and state policy and practice.

Decision makers and population health professionals across the country have used *The Community Guide* to make people safer and healthier.

■ When implemented, Task Force recommendations and other findings reduce health and economic burdens from disease, injury, and disability. The findings of the Task Force are an important component of

CDC's 6|18 Initiative to strengthen the interface between public health and health care. The initiative targets six common and costly health conditions—tobacco use, high blood pressure, healthcare-associated infections, asthma, unintended pregnancies, and diabetes. The Task Force identifies programs, services, and policies that can be carried out in communities, states, and healthcare settings to help save American lives and dollars, increase longevity, and improve quality of life.

The Community Guide in Action: Stories From the Field



The nationwide blood alcohol limit of 0.08% follows a Task Force recommendation. Citing evidence from the Task Force review and recommendation,

the FY2001 transportation appropriations bill required states to pass the **0.08% blood alcohol concentration law** by October 2003 or risk losing federal highway construction funds. Since the bill passed, all 50 states have enacted legislation dropping the legal blood alcohol concentration, saving an estimated 400–600 lives per year.



In Illinois, concerns of rising obesity rates led policymakers to write a plan for state standards that enhance **physical education in schools** based on evidence-based intervention strategies from *The Community Guide*.

The plan requires regular fitness testing in every school, as well as curriculum development. About 350–700 teachers are being trained to implement the related standards.



In implementing their home visiting program, the Montana Department of Public Health and Human Services used a Task Force

recommendation for home-based, multi-trigger, multicomponent environmental interventions that support **children and adolescents with asthma**. CDC awarded the agency funding for a quality improvement plan, which referenced the Task Force recommendation. Within 1 month, the proportion of children in the program who experienced asthma-related symptoms dropped from 23% to 7%.



Child safety seat use increased by 34% on the Yurok Tribe Reservation, 4 years after starting Buckle Up Yurok (BUY), a **motor vehicle injury prevention** program

developed by the California Rural Indian Health Board. In 2010, the board received a CDC grant to launch BUY. The grant required the program to use motor vehicle injury prevention strategies recommended by the Task Force. Program coordinator Danielle Lippert says, "The [Task Force's] findings helped us choose interventions that we could be confident were effective."

Informatics Innovation Unit (IIU)

The mission of the Informatics Innovation Unit (IIU) is to improve public health through the **development and discovery of innovative technology solutions**. IIU's goal is to facilitate cost and time savings, improve decision making, and provide creative solutions to augment public health impact.



Learn more about IIU

www.phiresearchlab.org

Our Services

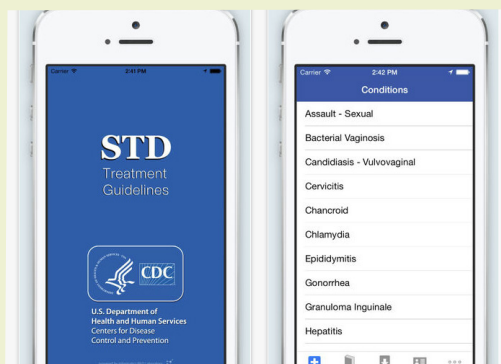
- **Consultation and guidance.** IIU's cross-functional team helps plan approaches to and strategies for informatics and technology questions.
- **Product design and development.** We quickly develop cutting-edge software applications for mobile devices and the web. We also create visual mockups (early design sketches) and prototypes to test new ideas and concepts. This enables programs to better refine requirements and test software and architectural approaches without the heavy commitment of resources.
- **Computing resources.** We provide on-demand, virtualized computing environments separate from the CDC network in a private cloud. IIU-hosted virtual desktops and servers are accessible anywhere in the world. Programs use our virtual project space to perform alternatives analysis, user acceptance testing, and baseline configuration development, and to estimate what hardware and software resources are needed.
- **Evaluation and testing.** Our team provides structured evaluations of technology, practices, and tools to assess their potential impact for public health. IIU personnel review existing or planned informatics or IT tools to help programs integrate new approaches.
- **Collaboration space.** IIU manages a physical collaboration space at CDC's Century Center campus in Atlanta, with demonstration capabilities, large video displays, Smart Board technologies, and Windows and Mac OS X workstations in an enclaved local area network—enabling in-person meetings for brainstorming, social media campaigns, communication activities, training, focus groups, and software demonstrations.

Our Impact

- **CDC is on the front lines protecting the public's health.** As technology changes, it's essential that CDC's workforce and health professionals have the most up-to-date technology resources available. We provide the expertise and environment to develop and test these resources.
- **A space to experiment and collaborate.** IIU provides an optimal, flexible, and scalable environment to rapidly develop, test, and evaluate prototypes outside the highly secure CDC network. Collaboration is vital to creating new informatics solutions that will improve public health practice.
- **Fast software application development.** We use the Scrum software methodology to quickly build applications. This process is iterative and incremental, which allows us to identify risk early in the development lifecycle.
- **We stay ahead of the curve.** IIU constantly explores new technologies—such as cloud computing, virtual reality, and innovative mobile devices—to assess their potential value to CDC programs. For example, our AppLab resource facilitates rapid testing and collaboration of prototype mobile applications.

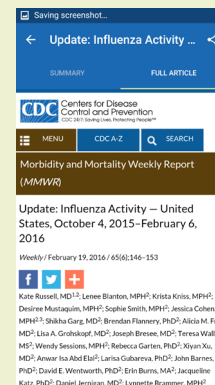
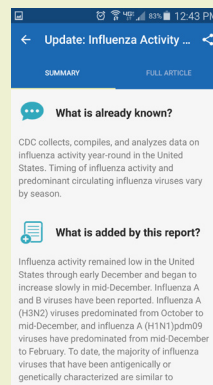
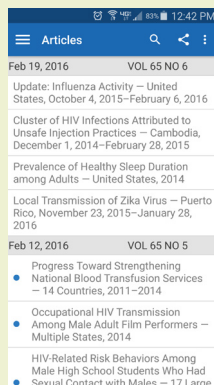
Mobile Apps for High-Priority and Emerging Public Health Issues

Working with CDC's Division of STD Prevention, IIU developed and recently updated the **CDC STD Treatment Guidelines** mobile app for iOS and Android platforms. It's one of the most popular CDC-produced mobile apps to date.



Based on the version for BlackBerry, our team developed an iOS version of the **Lifeguard app**, which helps CDC know the physical location of field staff—like Epidemic Intelligence Service officer, Dr. Kpandja Djawe (on the right)—deployed to handle crises such as Ebola.

Our team also developed the **MMWR Express** app for iOS (such as iPhone and iPad) and Android devices. The app provides fast access to the *Morbidity and Mortality Weekly Report (MMWR)* summary information and full articles.



Morbidity and Mortality Weekly Report (MMWR) Series

We are “**the voice of CDC**”—the *Morbidity and Mortality Weekly Report (MMWR)*. The *MMWR* Series is CDC’s primary channel for sharing authoritative and timely health information. Our priority is clear—**publish reports and recommendations** that protect the nation’s health, safety, and security. State and local health departments, healthcare providers, scientists, and others across the public health spectrum use information in the *MMWR* to improve public health.



Our Services

We publish the *MMWR* Series, which includes

- ***MMWR Weekly***, concise reports about current public health topics that inform urgent and non-urgent action, published as 51 issues a year
- ***MMWR Recommendations and Reports***, in-depth reports that relay CDC policy statements for prevention and treatment
- ***CDC Surveillance Summaries***, comprehensive reports that provide detailed interpretations of trends and patterns for public health action
- ***MMWR Supplements***, reports such as compilations of historic events or proceedings from national conferences
- ***Summary of Notifiable Diseases—United States***, official statistics, in tables and graphics, for the occurrence of nationally notifiable infectious diseases in the United States.

Our Expertise

Public health professionals in government, academia, and health care are invited to submit articles for publication. Articles must be

- **Appropriate** for the public health community, with findings and recommendations based on science (especially epidemiology) or on public health policy or practice. Recommendations contained within reports must be acceptable to CDC.
- **Original**, without previously published information or recommendations.
- **High quality** analyses that use accepted scientific methods and sufficient data to address the topic.
- **Timely** and include the most current data from surveys, surveillance systems, or studies.
- **Clearly written** in language that readers can understand.



Each *MMWR* report is cited as a reference an average of **8 times**

Our Impact

- **We are nimble.** Legionnaires' disease in the 1970s, HIV/AIDS in the 1980s, toxic shock syndrome, hantavirus pulmonary syndrome, and severe acute respiratory syndrome (SARS) were all first reported in the *MMWR*. These reports allowed medical authorities to take early action and ensured that accurate information was available to the news media and the public.
- **Science published in *MMWR* is widely shared.** Redistribution of our content is one of the most important ways we make an impact. Many *MMWR* reports are broadly reported in the news and blogs. In addition, during 2014 and 2015, we released articles in tandem with several major medical journals including *The Journal of the American Medical Association* and *The New England Journal of Medicine*. Our reports also are highly cited, with an average of **eight citations per report** in the last two years.
- **We have a long history as “the voice of CDC.”** The history of *MMWR* is the history of disease and injury prevention and control in the United States. First published as *The Bulletin of the Public Health* in 1878, *MMWR* plays a unique role in addressing emerging public health challenges by publishing preliminary investigations and recommendations to alert state and local health departments, as well as broader audiences.
- **We continue evolving to reach modern audiences.** In FY2016, *MMWR* had more than **278,000 electronic subscribers**, and our website and social media outlets had more than **22 million page views**. Our content is available through iPhone, iPad, and Android apps—*MMWR Express*. Our weekly podcasts, targeting a general audience, are among the most highly accessed CDC podcasts.

Milestones in *MMWR* History

1976–1977



An epidemic of pneumonia that followed the American Legion convention in the summer of 1976 led to much speculation in the media about the cause of the outbreak. Shortly after hospitalizations began, *MMWR* published the first report on what became known as

Legionnaires' disease. By early 1977, CDC had identified the organism that caused the disease. The information was published in a special *MMWR* report, helping to quell concerns and prevent more cases.

1981



After being alerted by a CDC Epidemic Intelligence Service officer assigned to the Los Angeles County Department of Health, *MMWR* published a report on five cases of a rare type of pneumonia in otherwise healthy young men. Thanks to this early alert, doctors

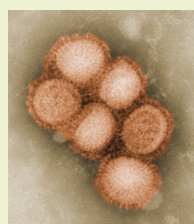
across the country began recognizing similar cases—the first indication of the **AIDS epidemic**.

1989



MMWR published nine reports in less than a year on a rapidly developing epidemic of a potentially fatal neurological disease first noticed in New Mexico. *MMWR* reports linked the illness with use of contaminated **L-tryptophan dietary supplements**, which led to an FDA recall of L-tryptophan products.

2009



CDC discovered that two cases of febrile respiratory illness in children from Southern California were caused by a new H1N1 influenza virus that came from pigs—a new type of **swine flu**. These two cases—the first of the 2009 H1N1 pandemic—were reported as an *MMWR* Early Release.

2014–2016



As an important part of CDC's largest emergency response, *MMWR* published 80 reports about Ebola, keeping officials and responders around the world up-to-date on the status of the **Ebola epidemic** and evolving best practices.

In FY2016, *MMWR*'s electronic reach included

- >22 million  Web page views
- >278,000  Electronic subscribers
- >17,000  Facebook likes
- >23,000  Twitter followers

Office of Public Health Genomics

The Office of Public Health Genomics is committed to helping public health programs, healthcare providers, the general public, researchers, and policymakers effectively use genomic information to improve health. Established in 1997, our office helps translate **genome-based discoveries into practices** that help prevent and control the nation's leading chronic, infectious, environmental, and occupational diseases.



Our Services

- **Collect and disseminate** the latest information on the health impact of genomics and family health history using communication channels including scientific publications, a weekly electronic update, blogs, social media, podcasts, and videocasts.
- **Evaluate the evidence** available to support use of genomic information and family health history to identify people at risk for disease, tailor treatments, and inform prognoses for people already affected. We identify and promote understanding of which genomics and family health history applications do—and do not—have evidence supporting their use.
- **Provide resources that support state and local health departments** in using genomics to improve health in their states and communities, including a Genomic Application Toolkit with healthcare provider and patient educational materials and case studies describing successful state efforts to use genomic knowledge to improve health.

Where Genomics and Public Health Intersect



Each year, more than **200,000 women** in the United States are diagnosed with **breast cancer** and more than **20,000** are diagnosed with **ovarian cancer**. While most of these cancers happen by chance, some are hereditary. That means they are caused by genetic changes called mutations that are passed down in families. The genes most commonly affected in hereditary breast and ovarian cancer are the **Breast Cancer 1 (BRCA1)** and **Breast Cancer 2 (BRCA2)** genes. About **3% of breast cancers** (about 6,000 women per year) and **10% of ovarian cancers** (about 2,000 women per year) result from inherited mutations in the *BRCA1* and *BRCA2* genes.

All women should learn as much about their family health history of breast and ovarian cancer as possible in order to know if they are at hereditary risk. We provide information and resources to help women understand **what these mutations mean**, how knowing their **family health history** can help them learn about their risk and treatment options, what they will learn from **genetic testing**, and how **genetic counseling** can help.



Our Impact

- **Genomics plays a role in 9 out of 10 leading causes of death in the United States.** Genomic risk factors contribute to who gets sick and who does not from a variety of infectious, environmental, and occupational exposures. Better understanding of these genomic risk factors can help us know who is more likely to be affected and target prevention efforts to people most at risk.
- **Genomics can transform health care and public health.** A new focus on precision medicine and precision public health promises advances in the ability to not only treat disease more effectively in individuals, but also to prevent disease and promote health.
- **The number of genetic and genomic tests available is growing rapidly.** Tests looking at single genes have given way to multigene panels and whole genomic sequencing. We keep the public and health practitioners on top of the evidence so they can better understand which tests are—and are not—helpful in preventing illnesses and deaths.
- **We developed Family Healthware™.** It's one of the first web-based family health history collection tools to use evidence to assess family health history risk for six common diseases and provide personalized recommendations based on that risk. The Family Healthware Impact Trial, conducted from 2003 to 2008, was the first randomized clinical trial on using family health history to inform health practices and outcomes. The study found that 82% of participants had a strong or moderate family health risk for at least one disease studied, highlighting how the effective use of family health history can play an important role in improving health. As of 2016, the study had produced 12 publications. It continues to provide findings that show the value of using family health history tools like Family Healthware. These tools can
 - ✓ Get family members talking about health histories
 - ✓ Help people better understand their disease risk
 - ✓ Identify more people at risk for certain diseases, many of whom don't get needed screenings
 - ✓ Increase healthy behaviors.



Keeping Track of the Emerging Landscape of Genomics

The public has an increasing interest in genetic information—about themselves and their health. The recently launched Precision Medicine Initiative and other efforts will lead to millions of people having their genomes sequenced in the next decade. Our office supports CDC's commitment to address the need for credible and scientifically-based information on what genomic information means for health and how it can be used to reduce the burden of human diseases.

- **CDC-funded state programs show the potential of evidence-based use of genomics.** For example, interventions funded between 2008 and 2010 identified more than 15,000 people in Michigan who might benefit from evidence-based genomic testing recommendations and extended testing coverage through policy interventions.

www.cdc.gov/genomics

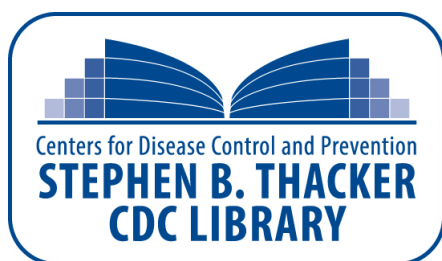
- ✓ Learn how and why to collect your family health history
- ✓ Explore how your state is using genomics to improve health
- ✓ Search our databases to find genomics information on your topic of interest
- ✓ Find out which genetic tests do—and do not—have evidence supporting their use

Stephen B. Thacker CDC Library

From the agency's first days, libraries have served as CDC's hub for research and information sharing. The Stephen B. Thacker CDC Library is a **full-service information resource center and scientific reference library** with access at our main library in Atlanta, at four other locations across the country, and online. CDC staff, contractors, and fellows—working in the United States and internationally—are the patrons who use our services to support their research and programs.


Our Services

- **Provide access.** Our team of professional librarians has more than **250 years of collective library science experience** working at CDC. They apply library science principles and current best practices to provide services such as complex literature searches in support of systematic reviews.
- **Maintain a comprehensive collection of electronic and print resources.** The library's collection includes the latest scientific resources and trends in addition to fundamental and rare resources. We have more than **120,000 unique items** in the library catalog, including more than 60,000 e-books, as well as seminal, rare, and historical books about public health.
- **Train CDC staff.** Our librarians use formal and informal opportunities to introduce new resources and services and instruct researchers on information management methods.



In FY2016, we helped CDC staff access

more than **1 million**  **electronic article downloads** and

responded to more than  **850 literature search requests**

The Scopus database provides access to

18,000 scientific  **journals**

Our Impact

We support CDC's critical mission to protect the public's health.

- **Our highly trained staff supports scientific research and projects across CDC.** Our expert reference services include searches of library catalogs and online bibliographic databases.
- **We hold an extensive collection of journal articles and books.** The CDC Library has holdings in all areas of public health, disease, and injury prevention, as well as in other subjects including leadership, management, and economics.
- **We use emerging tools to help measure the impact of our work.** Integrating new services allows us to measure the attention being paid to our scholarly research.
- **We publish *Science Clips*.** This weekly online digest features new CDC-authored research publications and trending topic articles, providing the public health community quick access to emerging scientific knowledge.



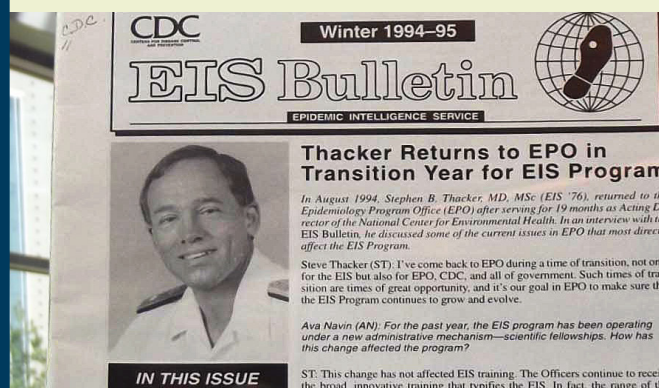
Science Clips reaches **24,000 subscribers** and is in the public domain. The digest highlights topics of interest for the scientific and public health communities and coordinates critical topics with *CDC Vital Signs™* and CDC's *Public Health Grand Rounds*. *Science Clips* is produced in collaboration with the Office of the Associate Director for Science.



We serve our patrons wherever they may be. CDC staff in Atlanta, across the United States, and internationally get quick access to library resources. We offer expert librarian services at our branches and through remote consultations. Through partners, we help state public health leaders access our resources.



The library dates back to 1946, when CDC was first established as the Communicable Disease Center. It was renamed in 2014 to honor **Dr. Stephen B. Thacker** who served CDC for 37 years as a public health advisor, mentor, and expert in infectious disease, epidemiology, and public health science.



Dr. Thacker's first day on the job as an EIS Officer in 1976 had him investigating a mysterious type of pneumonia that turned out to be Legionnaires' disease. He was a long-time champion of the CDC Library and published more than 240 books and articles on a wide range of scientific topics.



Dr. Michael B. Gregg (1930–2008) was editor of the *Morbidity and Mortality Weekly Report (MMWR)*—“the voice of CDC”—from 1967 to 1988. Under his leadership, *MMWR* strengthened its ability to provide accurate and timely public health information to healthcare and public health professionals on a widening scope of topics. In 1981, Dr. Gregg made a historic decision to publish a report in *MMWR* about a cluster of cases of a rare type of pneumonia among previously healthy young men in Los Angeles. Later, the report was recognized as the harbinger of the HIV/AIDS epidemic.



Scientific Education and Professional Development

Overview

Our Mission: To improve health outcomes through a competent, sustainable, and empowered public health workforce

Our Services

The changing public health landscape brings opportunities for embracing new approaches and also challenges the workforce to learn new skills for addressing evolving needs. We are committed to achieving our vision of a public health workforce prepared to meet emerging and future challenges.

Our Work

- Develop and deliver quality learning to strengthen the education, training, and professional development of the public health workforce.
- Enhance service, response, and consultation for fellowships, learning resources, and other public health workforce development activities.
- Provide leadership in national public health workforce efforts.
- Maximize our potential for achieving impact.

Our Programs and Activities

- Academic Partnerships to Improve Health (APIH): Public Health Fellowships
- Accreditation for CDC Learning Activities
- Career Paths to Public Health (CPP)
- CDC-Hubert Global Health Fellowship
- CDC Steven M. Teutsch Prevention Effectiveness Fellowship (PEF)
- Developing Quality Public Health Learning Products
- Epidemic Intelligence Service (EIS)
- Epidemiology Elective Program (EEP)
- Laboratory Leadership Service (LLS) Fellowship Program
- Population Health Workforce Initiative (PHWI)
- Presidential Management Fellows (PMF) Program
- Preventive Medicine Residency and Fellowship (PMR/F)
- Promoting Quality Public Health Learning Opportunities
- Public Health Informatics Fellowship Program (PHIFP)
- Strengthening Health Systems Through Interprofessional Education (SHINE)

**Public health
workforce
development**

**Quality learning,
valuable service,
national leadership**

**Diverse, competent,
sustainable public
health workforce**

**Improved capabilities
to provide essential
public health services**

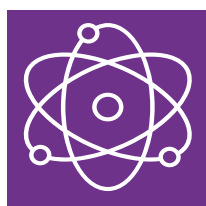
Division Highlights—FY2016

The Prevention Effectiveness Fellowship (PEF) demonstrates the value of prevention.



Since 1985, **143 PEF graduates** produced more than **3,700 publications** on the economic consequences of public health interventions

State and local public health laboratories now participate in the Laboratory Leadership Service (LLS) Fellowship.



LLS gives early career laboratory scientists a strong foundation in **laboratory safety and quality** and prepares them for future public health leadership

Our continuing education (CE) activities provide quality training—at no cost to learners.



More than **329,000 free CE credits**, contact hours, and units were awarded at a value of nearly **\$3 million** to learners

Our CDC Learning Connection website has enhanced access to CDC trainings.



More than **112,000 people** from **209 countries** visited the CDC Learning Connection

Our fellows and trainees provide valuable on-the-job service to health departments, partner organizations, and CDC programs.



102 trainees were placed in **37 states and territories**



EIS officers were involved in **153 investigations** in their jurisdiction

They responded to **52 Epi-Aids** in the U.S. and internationally

Moving Toward the Future

We look toward the future of the public health workforce by

- **Increasing the effectiveness** of workforce development in epidemiology, laboratory management, informatics, prevention effectiveness, population health, and policy
- **Improving response capacity** and support for urgent domestic and international needs through short-term technical assistance
- **Strengthening the skills** of the current health workforce through quality, accredited, skills-based training.

Academic Partnerships to Improve Health (APIH): Public Health Fellowships

In recent years, public health and health care have become more focused on population health. Partnerships and interprofessional collaboration are essential to improving population health outcomes and health equity. APIH focuses on **improving the health of individuals and communities** through alliances among academic associations, universities, and CDC. Using fellowships and workforce innovation projects, APIH serves as a **CDC-wide conduit** for public health workforce activities to **enhance population health education** for medical, nursing, and public health students.



Our Services

- Provide **training opportunities to recent graduates** at the master's, doctoral, and post-residency levels in various public health disciplines.
- Increase interest in **public health careers** and help students develop relevant skills for those careers.
- Further the synergy between health systems and public health by developing an innovative **population health curriculum**.
- Assess the value of **multidisciplinary approaches to education** to improve the health of our communities.

APIH **aligns academic associations with CDC** to collaborate on initiatives that meet education and training needs of the population health workforce. The partner associations are

- American Association of Colleges of Nursing (AACN)
- Association of American Medical Colleges (AAMC)
- Association for Prevention Teaching and Research (APTR)
- Association of Schools and Programs of Public Health (ASPPH)
- State and local teachers associations.

Our Work

- Facilitate CDC-wide **collaboration with partner organizations** on workforce innovation.
- Place partner organizations' **fellows in high-impact roles**, benefitting CDC as well as the sponsoring partners' professional disciplines.
- Develop and enhance **educational tools and resources**.

Our Impact

- **Fellows are groomed to be leaders in community-based health.** From 2012 to 2016, **76 fellows** have participated in this service-based learning program. They are mentored by a CDC expert and help meet critical staffing needs within the agency. Many fellows gain global health experience working at the Center for Global Health in Atlanta or at international locations.
- **Our partners are highly influential.** Partners represent more than **500,000 learners** in various medical disciplines, providing both high-quality fellows and important influence in protecting health.
- **We create a collaborative sharing environment for public health education.** Our expanded **MedEdPORTAL**, a go-to resource for clinicians and students, includes a public health collection that contains more than **320 resources** submitted by faculty, federal agencies, and other organizations. Our online communities of practice count more than **350 members**. Our Population Health Connect listserv counts more than **430 subscribers**.
- **We shape the way public health is taught to future practitioners.** In 2013, we worked with AACN to publish a supplement to *The Essentials of Baccalaureate Education for Professional Nursing Practice*. This publication defines how public health nursing should be taught. More than **1,500 copies** of the guide have been distributed or downloaded. AACN's supplemental toolkit for faculty has been distributed to more than **12,000 educators and practitioners**.
- **We want students to choose public health.** We actively encourage medical, nursing, and other graduate students to choose a career in community-based health, and we encourage educators to help lay a path for them. From 2013 to 2015, we conducted **9 webinars** that reached more than **1,100 students, faculty, and practitioners** to showcase public health as a career and the innovative ways it can be integrated into medical and nursing education.



APIH has established online **communities of practice (CoPs)** for public health education in medicine and nursing. CoPs are groups of people who share knowledge, stories, and tools in their field of interest and help one another solve problems. Our CoPs provide a forum for schools to share their innovations and support peer-to-peer learning. We have more than **350 members** including faculty, students, and public health professionals.

APIH public health fellowships cover topics designed to reach all areas of the health system. Examples include



An APTR/CDC fellowship focused on **policy issues** related to public health staffing and training



An AAMC/CDC fellowship focused on engaging **corporate chief medical officers** in partnerships for public health



An AACN/CDC fellowship focused on developing ways to address **students' chronic health conditions** in school settings

Accreditation for CDC Learning Activities

CDC's continuing education (CE) accreditation activities support the agency's role of ensuring high-quality training is available for the health workforce to protect the nation's health. CDC is accredited by seven organizations to provide **continuing education for health professionals** in the United States.

Our Services

- Improve **workforce knowledge, competence, and attitudes** that strengthen U.S. and global public health practice by promoting lifelong learning.
- Provide **accreditation services** for CDC programs and CDC-funded partner programs' educational activities.
- Ensure CDC's continuing education courses meet the standards and requirements for **reporting and assessment** set by the accrediting organizations.
- Connect health professionals with **accredited activities and support tools**.
- Look for ways to continuously improve the **quality and efficiency** of CDC's accreditation process.
- Offer CE for health professionals to help them meet **professional licensure** requirements.

Our Work

- **Share CE data** with CDC programs to evaluate learning activities.
- **Maintain and update systems** for tracking course registrations, courses completed, CE earned, and other information.
- **Pilot new models** for accrediting education and training activities more expediently.

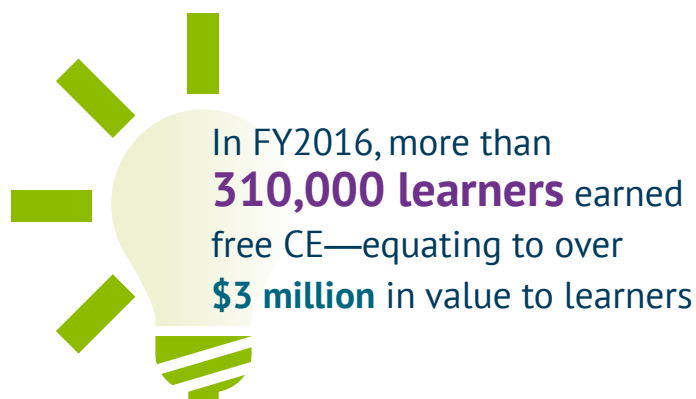


CDC is accredited by seven professional organizations

Physicians	Accreditation Council for Continuing Medical Education
All health professionals	International Association for Continuing Education and Training
Certified health educators	National Commission for Health Education Credentialing, Inc.
Certified public health professionals	National Board of Public Health Examiners
Nurses	American Nurses Credentialing Center's Commission on Accreditation
Pharmacists	Accreditation Council for Pharmacy Education
Veterinarians	American Association of Veterinary State Boards

Our Impact

- **A well-trained workforce is critical for protecting the public.** CDC's CE activities are designed to keep health professionals up-to-date on knowledge and practice in their field. The better trained they are, the better equipped they can be to keep the public safe and improve health. Accreditation ensures the courses they take are high quality—meeting standards set by accrediting organizations.
- **There's something for everyone—at no cost.** Professional continuing education can be costly. CDC's accredited courses are free and cover a wide range of topics, including health promotion, disease prevention, injury and disability, preparedness, and rapid-response education for emerging threats. They are easy to access through formats such as e-learning, journal articles, podcasts, printed materials, webinars, conferences, and workshops.
- **We continue to expand course offerings and support tools.** Plans for expanded offerings include healthcare worker trainings to address the latest global health threats like Zika.



In FY2016, CDC awarded nearly 329,000 CE credits, contact hours, and units

CNE for nurses	230,498
CME for physicians	41,805
Certificate for participation in CME for nonphysicians	30,328
CHES for health education specialists	14,050
CEU for other professionals	8,936
AAVSB for veterinarians	1,554
CPE for pharmacists	1,381

Career Paths to Public Health (CPP)

CPP ignites and inspires interest among the nation's future public health scientists by supplying **middle and high school teachers and their students** with an orientation to applied epidemiology and public health. We promote health literacy, provide professional development to teachers, and collaborate with them to create core resources and competency-based curricula for their colleagues around the world to use—introducing students to epidemiology and public health.

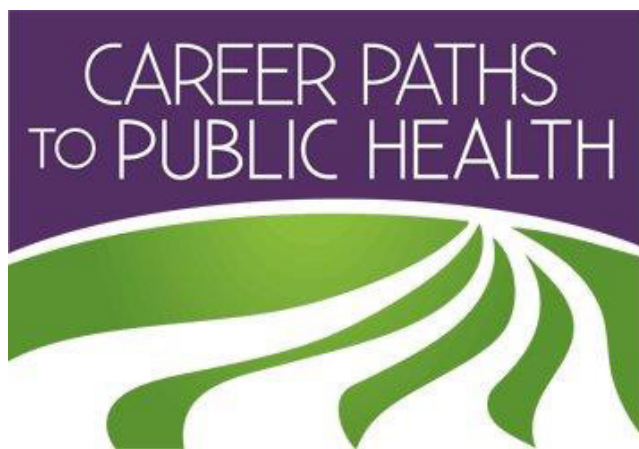


Our Services

- Develop **resources, tools, and competency-based lesson plans** designed to introduce the science of public health and epidemiology to middle and high school students in partnership with teachers and education-based organizations.
- Provide high-quality **professional development** for teachers.

We reach **middle and high school teachers and their students** by working with

- CDC programs
- Science Olympiad
- National Science Teachers Association
- State and local health departments
- State and local teachers associations.

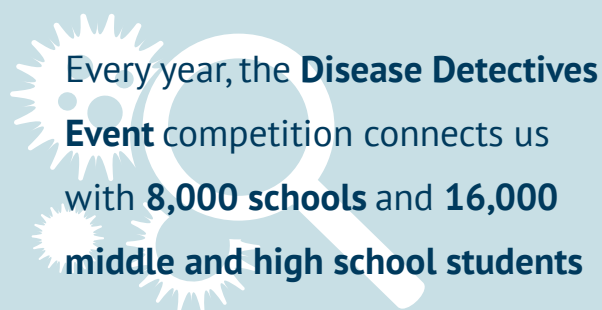


The CPP website features an important resource for educators: CDC's **Epidemiology and Public Health Science Core Competencies for High School Students**—the only

set of national standards for **teaching epidemiology and public health** at the high school level. It provides a framework for educators to use in teaching an entire course in this discipline. These **national standards** link with the Next Generation Science Standards and the Association of Schools and Programs of Public Health (ASPPH)-recommended critical component elements of an undergraduate major in public health.





Our Work

- Maintain the **Career Paths to Public Health website**, which provides a free online collection of teaching materials, tools, and activities that teachers use to introduce students to basic scientific concepts, provide them with experience in data analysis and interpretation, and promote critical thinking.
- Conduct the **CDC Science Ambassador Fellowship** to train middle and high school science and math teachers in public health, curriculum design, and teaching strategies. Fellows attend a 5-day workshop with CPP staff and CDC scientists to produce lesson plans aligned with CDC's Epidemiology and Public Health Science Core Competencies for High School Students. Fellows pilot the lesson plans in the classroom, present them at local teacher conferences, and help develop public health resource materials. The lesson plans and materials are added to CPP's resource collection.
- Supervise and write the exams for the middle school and high school **Disease Detectives Event at the national Science Olympiad**—an annual extramural team science competition designed to improve the quality of science education by fostering interest in a variety of science, engineering, and technology topics for grades 3–12. We maintain web-based event materials that coaches and students use to prepare for the competition and learn about public health. We have developed, provided guidance for, and sponsored the event since first partnering with the Science Olympiad in 1999. CDC also participates in and tests new strategies at a regional Disease Detectives Event tournament.



Our Impact

- **We are unique.** The CPP partnership between CDC and education-based organizations is one-of-a-kind, solely focused on teachers, students, and future public health workforce development. It has expansive reach to teachers and students across the nation and the globe. Our focus is on developing awareness of and interest in public health and supporting a strong early science foundation for the health workforce of the future.
- **Partnerships connect us with students across the nation.** By collaborating with education-based organizations, we have the capacity to reach teachers and students nationwide.
- **Our materials are free and easily accessible.** The Career Paths to Public Health website is a major distribution channel for quality epidemiology and public health educational materials. Teachers visit the site to find lesson plans, activities, and other teaching aids that have undergone rigorous review by CDC subject matter experts. Teachers can adapt the materials to a variety of teaching methods and approaches.

Since 2004,
206 STEM  **teachers** from
37 U.S. states  **and territories** and
3 other  **countries** have
 collaborated with CDC scientists
 to publish more than
100 K–12 public health  **lesson plans**

Visit our website

www.cdc.gov/careerpaths

Get ready for the next Science
Ambassador Workshop

www.cdc.gov/scienceambassador

Enter a Disease Detectives Event

www.cdc.gov/diseasedetectives

CDC-Hubert Global Health Fellowship

The CDC-Hubert Global Health Fellowship (Hubert Fellowship) is designed to encourage **medical and veterinary students** to gain a **global perspective of public health** through an experiential learning opportunity. Our fellows have worked on a wide variety of issues important to the health of the global community, such as avian influenza (bird flu), foodborne parasites, HIV/AIDS, rabies, birth defects, rotavirus, vaccines, and emerging infectious diseases.

Our Services

- Develop skills in **global applied epidemiology** for medical and veterinary students.
- Administer a program that
 - ✓ Begins at CDC with a **4-day orientation**
 - ✓ Continues at the fellows' school with **training and preparation courses**
 - ✓ Culminates in a **6- to 12-week field assignment** with mentoring by CDC and other experts.
- Arrange for medical and veterinary students to get **hands-on experience** working on a priority public health issue in a developing country.



Candidates for the Hubert Fellowship are 3rd- and 4th-year **medical or veterinary students**. The program is conducted in **collaboration** with

- CDC Foundation
- CDC programs
- International ministries of health
- Schools accredited by the Liaison Committee on Medical Education, American Osteopathic Association, and American Veterinary Medical Association.

Our Work

- Integrate the Hubert Fellowship with **other fellowship activities** at CDC, especially the postdoctoral Epidemic Intelligence Service (EIS) fellowship.
- Provide a **skills-based curriculum** with training in outbreak investigations, public health surveillance, global health, and cultural competency using adult learning principles.
- Use innovative methods to track our graduates' forward progress and **evaluate the contribution** of the Hubert Fellowship to the EIS program and the CDC workforce.

Our Impact

- **The Hubert Fellowship creates pathways to a career.**
Since 1998, we've trained more than 145 students—80% of them medical students. Many of our fellows go on to the EIS program, which in turn generates public health leaders at CDC, across the United States, and internationally.



Nearly **10%**
of Hubert fellows
are accepted into **EIS**

- **Fellows bring a global context to the U.S. workforce.**
Students get a firsthand look at the health challenges facing communities worldwide. As they progress in their careers, they can apply what they learned in their field assignments to similar problems at home—from infectious and chronic diseases, to environmental factors, to issues of health and safety.
- **Our program is a model for other CDC fellowships.**
Collaboration with EIS is vital to the Hubert Fellowship's success. We work together to plan our curricula. EIS officers help review and score fellowship applications, participate in orientation, and mentor Hubert fellows. We've also coordinated recruitment between the two programs to increase the number of underrepresented minority applicants.

Hubert Fellows Make a Difference

During their field assignments, Hubert fellows have

Helped determine the spread of disease-causing microorganisms in the **Thai bat population**, which will help educate people who live and work near bat caves about rabies prevention



Studied a **pneumonia vaccine**, introduced to Kenya in 2011, to learn about the vaccine's safety and adverse effects



Worked with health officials in Peru to better understand and improve treatment for **Chagas disease**—a life-threatening disease carried by insects that affects 6–7 million people worldwide.



Hubert Fellowship Global Assignments: 2011–2016



CDC Steven M. Teutsch Prevention Effectiveness Fellowship (PEF)

The PEF fills a critical need for **demonstrating the value of prevention**. Fellows conduct research that provides vital information to health policy decision makers about how best to allocate and use resources to maximize the impact of their public health programs. Over the past 20 years, CDC has recruited and trained a highly effective core of health economists through the PEF. The goal of this fellowship—the **largest 2-year postdoctoral training program** of its kind in the United States—is to ensure there are well-trained health economists with expertise in policy analysis and skills to consider economic issues in public health programs.



Our Services

- **Recruit and match fellows** to CDC programs in which they study the impact of prevention programs.
- **Implement a curriculum** that encompasses population health, analysis, policy, and leadership competencies.
- **Facilitate service and technical assistance** to state and local health departments and other partners through short-term field assignments and consultations.



PEF fellows include **professionals with doctoral degrees** in specialties such as economics, decision analysis, policy, engineering, and health services research



Fellows collaborate with **CDC centers and programs**, and state and local **public health departments**



PEF research helps **policymakers, Congress, and other government agencies** make informed decisions about health promotion and disease prevention programs

Our Work

- **Strategically market** the PEF to economists, engineers, health services researchers, and others from nontraditional backgrounds to enhance candidate diversity.
- Engage with programs across the agency in an intensive screening and review process to **select and match** as many fellows as possible with their first-choice programs at CDC.
- Develop curriculum, mentoring, career development opportunities, and other support to **transition new graduates** into CDC's research environment.
- **Create opportunities** for fellows to share their work through scientific manuscripts, policy briefs, teaching educational sessions, and presenting at national meetings and conferences.
- **Collaborate with experts** from other government agencies, academia, and the private sector around trainings and seminars to enhance perspectives of fellows and other CDC staff.

Our Impact

- **The PEF has developed 2 decades of government leaders in health economics.** There are more than 140 PEF alumni, nearly half of whom remained at CDC and represent 90% of the agency's economists. Many others are employed by other federal agencies.
- **PEF fellows enhance CDC's response to emerging health threats.** PEF fellows supported the Ebola outbreak response by serving in-country. PEF fellows also served on the team that developed the "Ebola Model" estimates of the number of potential cases of Ebola under a range of scenarios.
- **PEF graduates contribute to the health economics body of literature.** PEF graduates have published an estimated 3,700 papers in peer-reviewed journals over the past 20 years.

Highlights From the PEF Fellows 2014 Graduating Class

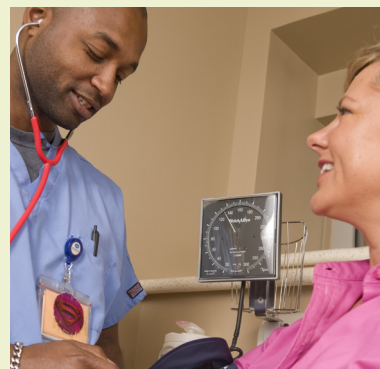
- Published **26 papers** in peer-reviewed journals
- Delivered **33 trainings** to 592 CDC staff and partners
- Made **25 presentations** at conferences
- 7 of the 10 fellows** secured jobs at CDC after graduation

PEF Contributions to Health Economics Knowledge and Practice

Research by PEF fellows has produced results with crucial public health impact. Their work has demonstrated that



Eliminating one of the **pneumococcal conjugate vaccine booster shots** from the four-shot series could save \$500 million per year (\$300 million for CDC) with minimal adverse health effects.



Eliminating **cost-sharing for recommended preventive services**—an important provision of the Affordable Care Act—significantly increased use of these services.



CDC central line-associated bloodstream infection education efforts prevented 40,000–75,000 infections and produced net benefits of at least \$640 million from 1990 to 2008.



The **Tips From Former Smokers** campaign—the first federally funded national mass media anti-smoking campaign—cost only \$393 for every life saved and was a highly cost-effective intervention.

Learn more about our program at www.cdc.gov/PEF.

Developing Quality Public Health Learning Products

We design and develop high-quality learning to help CDC programs meet professional development needs of the public health workforce. We provide **comprehensive training development services** for CDC programs and training fellowships. We also help build the capacity of health educators, e-learning developers, and trainers through the **eLearning Workgroup (eLWG)** and **CDC E-Learning Institute (ELI)**. By developing quality learning, we ensure learners receive effective training to apply best practices in the field of public health.



Our Services

- Design and develop innovative **technology-based training** for CDC programs. An example is **Quick-Learn lessons**—a form of e-learning designed to address one or two objectives and take less than 20 minutes to complete.
- Develop **interdisciplinary training** for CDC fellowship programs.
- Provide ongoing **professional development** by connecting health educators, e-learning developers, and trainers for peer support and sharing quality materials, tools, and resources.

We build capacity among **education and training professionals** through

- **eLWG**, a collaborative workgroup for CDC staff to share expertise and establish CDC best practices for e-learning design and development
- **ELI**, a 4-month fellowship primarily for state and local health department training staff to build skills in developing innovative e-learning products by working with CDC and other public health e-learning mentors.

Our Work

- Consult with CDC programs and partners on **training design and development**.
- Provide resources that help those new to e-learning **understand the basics** and assist e-learning developers with **creating quality products**.
- Help CDC fellowships meet **quality learning standards**, and build collaboration and **improve efficiencies** for training.
- Evaluate and update **fellowship curricula** based on evaluation data and program needs.

Our Impact

- **A well-trained workforce is critical for protecting the public's health.** The development of **skills-based training** that we continuously assess and improve ensures learners receive the highest quality training. A quality-trained workforce is better equipped to keep the public safe and improve health.
- **Quality e-learning tools allow CDC to expand expertise of the health workforce.** Training courses and tools have covered a range of topics for health professionals both nationally and internationally.
- **Our learning tools are recognized for excellence.** In 2015, our **safety training toolkit** for healthcare workers deployed to fight Ebola in West Africa won a Bronze Award in the 17th Annual Digital Health Awards. The toolkit teaches the principles of infection prevention and control using lectures and interactive exercises.
- **We have a well-defined model for advancing health education and training.** With groups like **ELI and eLWG**, we give learning professionals a “virtual” space to mentor one another, stay on top of industry standards, and actively engage in finding solutions, making decisions, and moving their field of practice forward. CDC and its partners reap the benefits of a better prepared workforce and more efficient and effective practices, which ultimately helps us deliver better health-related services to our communities.
- **E-learning is cost savings.** It helps employers save money by allowing employees to participate in training without having to travel. We provide tools and guidance to educators at state and local health departments on effective ways to transition from more resource-intensive classroom training. This helps health departments grow their own experts rather than having to hire outside consultants or trainers.
- **We build tools and capacity for e-learning.** We developed the **Quick-Learn Design Toolkit**, which provides a template and guide for developing a short e-learning experience based on a single learning objective. The toolkit is available for use by both CDC and external partners.



In its first 4 years, more than
40 state, local, and international health professionals completed the ELI fellowship program

Since 2009, eLWG has
 expanded to include nearly
100 CDC e-learning professionals



Take our Quick-Learn lessons
www.cdc.gov/learning/quick_learns.html

Use our Quick-Learn Design Toolkit
www.cdc.gov/learning/quality/toolkit.html

Epidemic Intelligence Service (EIS)

Think of any major disease outbreak or other public health threat, and chances are a CDC EIS officer—or disease detective—was one of the first on the scene. Since 1951, CDC has trained **more than 3,600 EIS officers**. During their training they serve on the front lines of public health, protecting Americans and the global community as “boots on the ground” epidemiologists. They respond to urgent public health threats by identifying the cause, rapidly implementing control measures, and collecting evidence to recommend how to prevent future events.

Our Services

- EIS is a “**training through service**” model. More than 90% of this training occurs under the guidance of seasoned mentors (usually EIS alumni). Our core curriculum retains “**tried and true**” methods used for more than 65 years, but also adapts to current public health needs.
- Each year **70–80 new physicians, veterinarians, scientists, and other health professionals** learn to
 - ✓ Apply **epidemiologic skills** critical for identifying, preventing, and controlling major threats to the public’s health
 - ✓ Become **public health rapid responders**, stepping up at a moment’s notice to investigate health threats in the United States and around the world.
- EIS offers graduates a **gateway to finding successful careers** that allow them to have an important impact on health policy and decision making.



EIS officers reach people from U.S. cities to remote global villages who are threatened by disease outbreaks or other threats to the public’s health. EIS responds in partnership with

- State and local health departments
- CDC programs
- Commissioned Corps of the U.S. Public Health Service
- Federal agencies working in public health
- International ministries of health.



*EIS officers were involved in **153 investigations** in their jurisdictions in 2016*

Our Work

- **Supervise and support** EIS officers.
- Collect data to **inform recruitment strategies, training programs, and conference content** that target the skills EIS officers need and prepare them for postgraduate success.
- **Collaborate with experts** both inside and outside CDC to maintain high-quality training and placement of EIS officers.
- **Respond to trends** in requests for assistance to ensure continued timely deployment of EIS officers.

Our Impact

- **We train tomorrow's public health leaders.** EIS alumni have gone on to become CDC directors; leading CDC scientists; acting surgeons general; WHO assistant directors-general, regional directors, and country directors; public health and medical school faculty and deans; city health commissioners; and state epidemiologists. Others are leaders in industry, foundations, nongovernmental organizations, and the media.
- **EIS officers are on call to protect people.** When a disease outbreak occurs or natural disaster strikes, we can mobilize our officers to go anywhere in the world to investigate and assist. EIS has provided rapid response to urgent health threats for more than 60 years—from investigations of possible biological warfare during the Korean war, to the smallpox and polio eradication campaigns, to the discovery of Legionnaires' disease and Lassa fever, to responses to Hurricane Katrina and 9/11, and of course the 2014 Ebola outbreak.



More than **80%** of EIS program graduates enter the public health workforce



More than **30%** of state or large city epidemiologists are EIS alumni



In FY2016, EIS officers responded to **52** requests for assistance in the U.S. and internationally

In FY2016, EIS officers contributed almost 2,400 days of work to the Zika response—like this EIS officer inspecting possible mosquito breeding areas in American Samoa



Epidemiology Elective Program (EEP)

Through EEP, **medical and veterinary students** are trained in public health and applied epidemiology and gain a **population health perspective** that influences their career choices and practice beyond graduation. An elective rotation in public health and applied epidemiology is vital in introducing future physicians and veterinarians to the practice of public health and provides valuable role models for pursuing public health careers.

In 1975, CDC initiated EEP for senior medical students to increase awareness of and interest in public health and epidemiology. In 1982, the program added veterinary students. During **6- to 8-week rotations**, students help investigate and solve important, **real-world health problems** including infectious disease outbreaks, natural disasters, chronic disease issues, and access to health care. They collaborate with other public health professionals on these investigations, often working closely with **Epidemic Intelligence Service (EIS) officers**—CDC’s “disease detectives.”



Our Services

- Introduce **senior medical and veterinary students** to preventive medicine, public health, and the principles of applied epidemiology.
- Develop skills through **hands-on experience** in applied epidemiology for senior medical and veterinary students.
- Connect some students with experienced **CDC epidemiologists** as mentors to help them
 - ✓ Learn through hands-on experience
 - ✓ Participate in surveillance of an important public health problem
 - ✓ Analyze health data for new disease risk factors
 - ✓ Work in the field to investigate an outbreak
 - ✓ Coauthor a publication of major health importance.

EEP enrolls **fourth-year medical and veterinary students**. The program is conducted in **collaboration** with

- CDC programs
- Indian Health Service
- National Park Service
- Schools accredited by the Liaison Committee on Medical Education, American Osteopathic Association, and American Veterinary Medical Association.

More than **1,850** senior **medical and veterinary** students have enrolled in EEP



Our Work

- Arrange for **60 to 70 medical and veterinary students** each year to get hands-on experience working on a priority health problem in a CDC program, Indian Health Service, or National Park Service assignment.
- Complement and **work with other CDC fellowships**, especially EIS.
- Follow students after they graduate and **evaluate their contributions** to EIS, CDC, and public health.

Our Impact

- **Graduates become our nation's health leaders.** Many EEP students go on to careers protecting the public's health. This career path may begin with their participation in the postdoctoral EIS fellowship. Many have become CDC Preventive Medicine Residents, certified by the American Board of Preventive Medicine.
- **EEP sets an example for efficient use of training resources.** We begin the process of applied epidemiology training within CDC. Our students participate in short-term epidemiology projects, attend CDC presentations and EIS seminars, assist EIS officers in the field (including Epi-Aid investigations), and coauthor scientific articles. Some go on to more indepth training as EIS officers.

EEP funnels young talent into the public health workforce



Since 1975, **249** graduates have entered **EIS**

More than **60%** of them took jobs in **public health**

More than **40%** of those in public health went to work for **CDC**



"I have been on the fence about whether I want to pursue EIS, and this elective has made me realize the EIS is definitely in my future."

~2015 EEP veterinary student

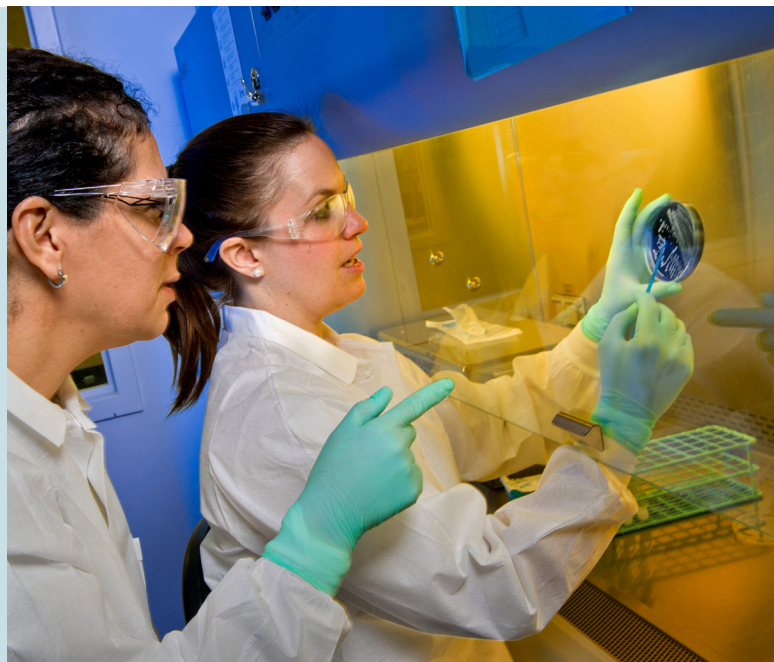
"This is an experience I will never forget and that I will carry with me as I pursue a career in preventive medicine."

~2015 EEP medical student

Laboratory Leadership Service (LLS) Fellowship Program

The LLS Fellowship Program prepares **early-career laboratory scientists** to become future public health laboratory leaders. Our focus on integrating **safety and quality** as principal elements in all their work is vital to protecting the public's health, safety, and security. Launched in 2015, this **2-year competency-based fellowship** furthers CDC's and partners' commitment to advancing laboratory biosafety and quality.

The LLS program lays a strong foundation for graduates to attain future leadership positions in public health laboratories. LLS aligns with CDC's **Epidemic Intelligence Service (EIS)** to promote interdisciplinary training, applied learning, and networking between laboratory scientists and epidemiologists.



Our Services

- Deliver a high-quality competency-based curriculum that combines **classroom learning with applied service** to develop future public health laboratory leaders.
- Promote opportunities for fellows to conduct **cutting-edge research** in applied public health laboratory sciences.
- Offer opportunities for fellows to design, implement, and evaluate public health laboratory **quality management** systems.
- Provide **management and leadership training** for fellows to complement their scientific expertise.
- Build a joint **professional network** between LLS fellows and EIS officers.
- Improve the **safety culture** of public health laboratories by training fellows to perform comprehensive laboratory risk assessments and mitigations.

LLS **candidates** are early-career scientists with doctoral degrees in a laboratory-related discipline.

The program works in **partnership** with

- Association of Public Health Laboratories
- CDC laboratory leadership, including the Office of the Associate Director for Laboratory Science and Safety and associate directors for laboratory science
- CDC laboratory scientists
- Epidemiologists
- State and local public health laboratorians.

While at work in CDC's laboratories, LLS fellows



Provide **on-the-job service** as they participate in applied public health laboratory research



Learn to apply public health **laboratory competencies** to real-world public health scenarios



Develop skills in **laboratory science, safety, and quality management** systems, gaining valuable preparation for future leadership positions

Our Work

- Provide an **intensive 1-month training program** at the beginning of the fellowship—with expert instructors from CDC, state and local public health laboratories, and other partners—followed by a more advanced classroom training later in the fellowship.
- Match each fellow with a **public health laboratory**, where they work under the mentorship and guidance of established laboratory scientists and gain real-world experience helping to solve urgent public health problems.
- Provide activities that make **integration of safety and quality** a focus of on-the-job training.
- Respond through **Lab-Aids**, a laboratory research response parallel to the EIS Epi-Aid service, through which public health laboratories can request assistance on short notice from fellows and CDC staff when urgent health problems arise.
- Build our program on the successful and well-established **EIS framework and infrastructure models**.

Our Impact

- **We fill a critical gap in laboratory training. LLS helps CDC meet its commitment to enhanced laboratory safety by quickly addressing needs.** Our program is also a proving ground for newly established performance skills for public health laboratory training that other training programs may want to adopt.
- **We provide a cornerstone in CDC's national and global model of excellence for public health laboratories.** LLS graduates maintain the highest quality public health laboratory science by applying principles of safety and quality management systems.
- **Fellows learn the value of collaboration.** Since the LLS and EIS programs are aligned, participants in both programs start their careers as colleagues, creating a model for future collaborations between laboratory scientists and epidemiologists.

In 2015, LLS celebrated several firsts

February 2015: First class of seven fellows matched with their CDC host laboratories

July 2015: First laboratory safety and quality management training provided to fellows

July 2015: First fellow deployed on a Lab-Aids assignment, working with EIS officers to investigate *Mycobacterium avium* infections in heart surgery patients

December 2015: First fall course held, providing advanced laboratory safety and quality management training for fellows



"The Laboratory Leadership Service. . .will create tomorrow's leaders in laboratory science and safety."

~Dr. Thomas Frieden, CDC Director

Population Health Workforce Initiative (PHWI)

Improving health outcomes in the United States is a significant driver of CDC's PHWI, which adds a **population health focus** to existing CDC fellowships. We serve as an **overarching curriculum and mission** for longstanding fellowships in preventive medicine, informatics, health policy, and health economics. We engage fellows with unique opportunities to solve complex problems by collaborating with health departments, community health agencies, and health care delivery organizations. Our aim is to **link health departments and healthcare systems** to improve the community's health while also grooming professionals who can lead in the emerging population health environment.

Our Services

- Create **multidisciplinary teams** of population health professionals to integrate health departments and healthcare systems.
- Use **interprofessional education** to train population health professionals and prepare them for collaborative approaches to problem solving.
- Ensure PHWI efforts **complement existing CDC fellowship programs** and other major national initiatives associated with population health.
- Unify existing fellowships with a **common curriculum and mission** in population health workforce development, giving learners in a variety of disciplines hands-on training and a common understanding of population health policy development and service delivery.



PHWI aims to develop the **next generation of population health leaders** in areas of public health, health care, and community health. To do this, we **collaborate** with

- Academic partners like the Association of American Medical Colleges and the Association of Schools and Programs of Public Health
- State and local public health agencies
- CDC programs
- Communities with dedicated population health training sites to host CDC fellows
- Healthcare sector
- International ministries of health.

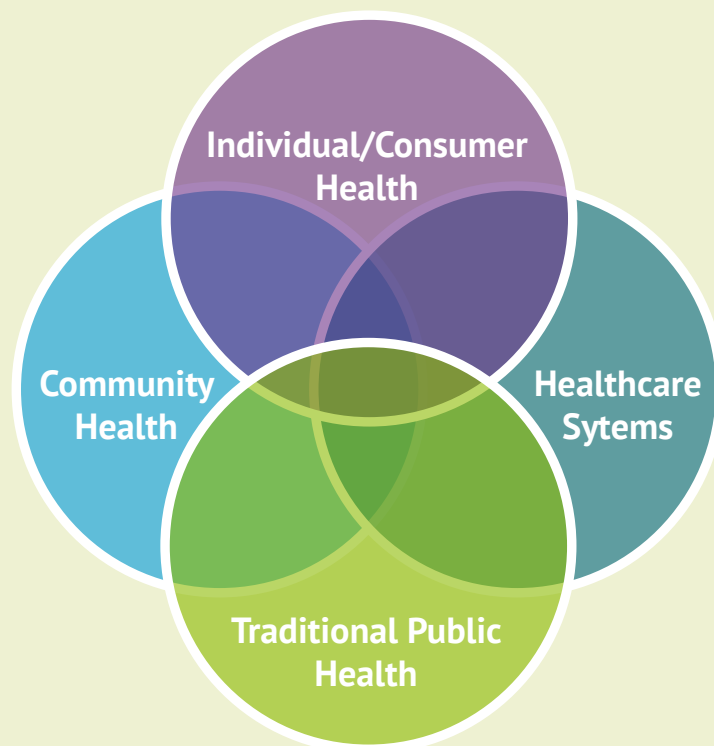
Our Work

- **Develop a population health curriculum** that covers multiple disciplines and links fellows with relevant and timely training resources.
- **Engage partners** in recruiting training sites and developing the curriculum.
- **Restructure and realign** existing fellowship programs and cooperative agreements to include a population health focus.

Our Impact

- **PHWI is where other training programs intersect.** CDC has well-established fellowship programs in preventive medicine, public health informatics, prevention effectiveness, and policy and management. They are well-positioned to integrate the public health and healthcare systems. Under PHWI, fellows from different disciplines are placed in interrelated work environments to bring their unique skills together to resolve issues and address health challenges.
- **We prepare the next generation of population health leaders.** To meet tomorrow's workforce needs and better protect the nation's health, public health agencies, healthcare systems, and communities must come together. As a result of PHWI, fellows provide an infusion of leadership talent and partnerships that CDC and local agencies, hospitals, and clinics can build on. These are the healthcare partnerships of the future.
- **We bring health departments and health systems together to improve the well-being of communities nationwide.** Using PHWI's total population health approach, health departments play a significant role in convening major stakeholders from various sectors of the community—such as health care, industry, education, and public safety—to strategize health priorities and promote a culture of wellness as diverse as the needs of the people they serve.

The Total Population Health Approach



Collaboration provides a strong foundation for health. Leveraging talent, expertise, and infrastructure leads to better health for the entire community. The multidisciplinary aspect of PHWI supports the full spectrum of population health.



Presidential Management Fellows (PMF) Program

Since 1977, the PMF Program has attracted outstanding **graduates from various academic disciplines** who are committed to excellence in federal service, leadership, and management. It is a distinguished, highly competitive **2-year career training program in leadership and management** for recent graduates with master's, law, or doctoral degrees. The government-wide program is run by the Office of Personnel Management. Fellows serve in many federal agencies.

CDC adopted the PMF Program in 1988. Since then, we have recruited more than **280 exceptional fellows**. In 2014, the program added a track for fellows with backgrounds in **science, technology, engineering, and math (STEM)**. This allows the government to address a critical skill gap. At CDC, our outstanding PMF STEM candidates fill positions in areas such as epidemiology, economics, biostatistics, biology, toxicology, information security, biohazard threats, and geographic information systems.

PMF PRESIDENTIAL
MANAGEMENT
FELLOWS PROGRAM
U.S. OFFICE OF PERSONNEL MANAGEMENT

Our Services

- Provide an effective **skills-based curriculum** that combines on-the-job training with classroom-based learning and mentorship.
- Develop a **robust recruitment plan and placement process**, with a special focus on increasing the number of STEM fellows at CDC in areas such as biohazardous threats, emerging diseases, chemistry, food science, nutrition, resource economics, toxicology, and veterinary medicine.
- Illustrate the **value and impact** of the program at CDC.

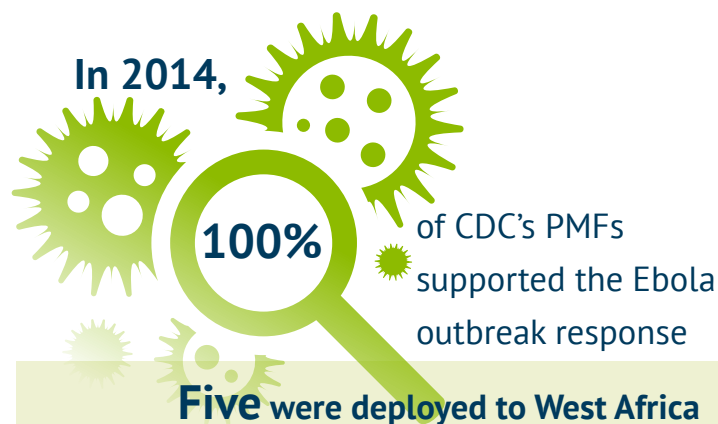
Our Work

- **Recruit and place candidates** in health policy, management, and leadership training positions at CDC.
- Work with a curriculum development committee of former PMF graduates and education subject matter experts to **enhance the traditional PMF curriculum** and **incorporate a STEM focus**.
- **Track PMF activities** to assess how the fellows perform, how effective they are at CDC, and how well the curriculum meets their needs.
- **Highlight fellows' accomplishments** at CDC in showcases such as annual PMF symposia and reports.



Our Impact

- **The PMF Program brings the best and brightest into public service.** It is the federal government's premiere pipeline for moving advanced degree graduates into government leadership positions. Candidates undergo a rigorous screening process that whittles down an initial pool of thousands of applicants to approximately 600–800 finalists. The CDC PMF Program attracts more than 250 applicants annually from a variety of academic disciplines and consistently hires one of the largest cohorts of fellows at HHS.
- **PMF alumni become CDC leaders.** They have gone on to senior staff positions as policy directors, center directors, and the agency's chief of staff. STEM fellows are trained to lead the federal science and technology enterprise, manage research and development programs, develop technically-informed policies and regulations, and respond to natural and manmade disasters.
- **Fellows are valuable to CDC's mission.** PMFs produce important work to help advance public health. Fellows and alumni have made significant contributions to public health policy, program planning and evaluation, and strategic communications at CDC and across federal agencies. As part of their training, fellows must complete an assignment in another CDC office or federal agency or at a state or local health department. These assignments allow fellows to cultivate critical partnerships as they learn to apply their knowledge and skills.

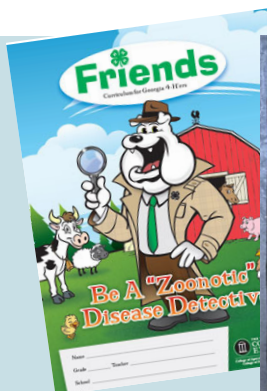


Presidential Management Fellows include **recent master's, law, or doctoral** graduates—including those with STEM degrees—who are committed to public health.

PMF positions are tailored to each fellow's career goals, offering hands-on training and mentorship experience. The program provides a **pathway to CDC management and policy leadership** positions. Most PMF positions are located at CDC headquarters in Atlanta, Georgia. Others are in CDC facilities in Maryland, Ohio, Pennsylvania, Colorado, Washington, DC, and several international locations.

Since 1988, CDC has **recruited more than 280 PMFs**

Approximately **87%** have been **permanently employed at CDC**



PMFs have produced innovative work at CDC. For example, through a **partnership with 4-H**, one of our fellows led a group of scientists, communications experts, and artists in producing a **magazine for fifth and sixth grade students**. The magazine, called *Friends*, teaches students about preventing zoonotic disease (diseases that spread between animals and humans, like swine flu and *Salmonella* infections). **Graphic novellas target junior high students** to teach them about zoonotic disease, help them understand CDC's role in public health outbreaks, and spur their interest in science.

Preventive Medicine Residency and Fellowship (PMR/F)

Since 1972 the PMR/F program has provided national leadership in graduate medical and health professional education. We develop public health leaders prepared to efficiently identify and address major population health issues. Our fellows develop skills in project management, program evaluation, policy analysis, grant management, and community health improvement.

Our Services

- Develop the **leadership and management skills** necessary for population health leaders by coordinating the
 - ✓ **Preventive Medicine Residency (PMR)**, established in 1972, which has a 24-month track for physicians without an MPH and a 12-month track for those with an MPH
 - ✓ **Preventive Medicine Fellowship (PMF)**, a 12-month fellowship established in 1983 for nurses, veterinarians, and dentists with an MPH
 - ✓ **Population Health Training in Place Program**, established in 2015 for physicians and doctoral-level learners to develop leadership and management skills in population health practice while remaining in their jobs.
- Provide **training opportunities** that focus on growing and applying critical leadership skills needed for policy development, program evaluation, and community health improvement.

Learn more about PMR/F

E-mail: prevmed@cdc.gov

Phone: 404-498-6181



PMR/F learners include

- Selected Epidemic Intelligence Service graduates (physicians and veterinarians) and other comparably trained professionals
- Other health professionals—nurses, dentists, physician assistants, and international medical graduates.

To develop leaders in public and population health, PMR/F works **in partnership with**

- Federal, state, local, and tribal health departments
- Public and population health stakeholders
- Private and nongovernment organizations.

Our Work

- **Recruit and place** top applicants in public health, health care, and community health settings where they are mentored by experienced practitioners.
- **Maintain a high-quality curriculum** and supervised practical experience to expand leadership skills needed to develop efficient, effective, and sustained public and population health programs that improve community health.
- **Provide global leadership** in the field of preventive medicine education.
- **Collaborate with capacity development initiatives** at CDC and other organizations to strengthen the public and population health workforce.

Our Impact

- **We're addressing a critical shortage of preventive medicine physicians.** A 2007 Institute of Medicine report found that the nation needs more trained public health workers, including public health and preventive medicine physicians. Through PMR/F, CDC offers opportunities for health professionals to train in a high-demand specialty and provide a vitally needed service to communities and the nation.
- **We develop leaders in population health.** Residents and fellows learn to design, launch, and assess public health programs, develop or analyze health policy, or conduct a community health improvement project. Some work at CDC, while others play critical roles in state and local health departments, at universities, or in private sector agencies. In 2015, we launched a new professional development program—the **Population Health Training in Place Program**—for CDC staff to develop leadership and management capacity to improve health care, lower patient costs, and improve the health of populations.
- **Ours is the only nonmilitary, federal-level preventive medicine residency.** We provide a unique training program for medical graduates who want to pursue careers in population health. The PMR meets the residency requirement of the American Board of Preventive Medicine for the public health and general preventive medicine specialty.



As part of his PMF experience, Ernie Sullivent was assigned to the **Aerial Distribution of Rabies Vaccine** for the Regional Rabies Control program in the **Texas Department of State Health Services**. He evaluated the agency's oral rabies vaccination program in south, central, and west Texas. His evaluation showed that this program effectively eliminated rabies in the coyote and gray fox populations. This activity has **prevented an estimated 2,600 cases of rabies** in wild animals a year. There were two human deaths from rabies before the program began; there have been no cases of human rabies since.

Promoting Quality Public Health Learning Opportunities

For decades, health professionals have looked to CDC for quality, up-to-date education and training to improve practice and meet professional development goals. In 2010, the **CDC Learning Connection** was launched as a website to promote quality learning and help the health professional community find CDC trainings. Since then, the CDC Learning Connection has grown beyond a website to engage public health and healthcare professionals around the world through social media messaging and e-newsletters.

CDC Learning Connection is also a pathway to access **CDC TRAIN**—a dynamic learning management system that allows users to locate and track learning and enables CDC to manage training for a wide variety of learners. CDC TRAIN is a part of **the Public Health Foundation's TRAIN**, the nation's premier learning resource for professionals who protect the public's health. The system is currently used by 25 states and 3 federal agencies.



CDC Learning Connection features

- ✓ New learning opportunities that align with public health events and observances
- ✓ A no-cost way for CDC programs and partners to promote their trainings to a large audience of professionals
- ✓ The ability to view the site from any device, mobile or desktop
- ✓ The opportunity to subscribe to a monthly e-newsletter that delivers new CDC trainings directly to your inbox
- ✓ E-learning design tools and resources.



CDC TRAIN features

- ✓ A no-cost centralized delivery system for CDC programs and partners to manage and market their trainings
- ✓ Access to more than 7,700 courses in a variety of formats (classroom training, webinars, online self-study)—more than 1,500 developed by CDC programs
- ✓ Advanced search capabilities to find the right course
- ✓ User feedback through course ratings and discussion boards
- ✓ A transcript function for learners to track professional development.

Our Services

- Partner with the **Public Health Foundation**, a private nonprofit training organization.
- Work with leaders across the agency to identify **relevant and timely educational activities** to promote on CDC Learning Connection and add to CDC TRAIN.
- Conduct **outreach and promotion** to increase awareness of CDC TRAIN and CDC Learning Connection through electronic communication channels (e-newsletters, social media, website features, etc.) and presentations to internal and external audiences.

Our Impact

- **CDC Learning Connection and CDC TRAIN reach a growing worldwide audience.** These platforms get educational tools to health professionals quickly to respond to public health needs. In FY2016, more than **112,000 people** from **209 countries** visited the CDC Learning Connection website to find out about public health training opportunities. A course listed in CDC TRAIN can reach more than **1 million professionals** registered across the entire TRAIN system. In FY2016, more than **89,000 people** registered for public health trainings in CDC TRAIN.
- **We engage the public health community in interactive ways.** As of FY2015, the monthly e-newsletter had more than **68,000 subscribers**. CDC Learning Connection's broad reach through electronic communication channels helps to increase public health workforce awareness of CDC's training opportunities.
- **CDC TRAIN helps programs and partners meet their training goals.** More than **74 CDC programs** and many funded partners now list their courses on CDC TRAIN to maximize course visibility. Several CDC programs actively use the system to evaluate trainings and manage the learning process for a group of learners.



CDC Learning Connection and CDC TRAIN are aimed at

- **Learners**—Public health and healthcare professionals (e.g., epidemiologists, first responders, health educators, laboratorians, nurses, physicians, scientists, veterinarians)
- **Training Providers**—CDC and CDC-funded public or private organizations who provide and publicize public health training courses
- **Training Offerors**—CDC and CDC-funded public or private organizations who use CDC TRAIN to deliver, manage, and evaluate workforce training.



In FY2016, we supported the Zika response by ensuring Zika-related training and other activities were easily accessible from the CDC Learning Connection home page, the CDC Zika Virus website, and through a button to search CDC TRAIN.

Public Health Informatics Fellowship Program (PHIFP)

Public health information systems play an increasingly prominent role in helping move the right information to the right person at the right time—so the right public health decisions can be made. Health information systems and new sources of data are growing in complexity. This creates a need for **information systems that are thoughtfully designed** so the population health workforce can interpret data and solve public health problems. Now more than ever, public health and healthcare organizations need a competent workforce that can develop, manage, and evaluate these complex information systems.

PHIFP, established in 1996, provides on-the-job training for doctoral- or master's-prepared professionals. While working in CDC programs to **enhance our agency's informatics workforce**, fellows help state and local health departments and international public health agencies solve complex public health informatics challenges. They apply expertise in information science, computer science, and information technology to address current and future informatics needs.



PHIFP fellows include **professionals with doctoral or master's degrees** in

- Public health, medicine, health care, health services research
- Computer science, information science, information systems
- Statistics
- Epidemiology
- Public health informatics or a related discipline.

PHIFP aims to provide **robust informatics capacity** primarily to CDC, but also to other public health organizations.

Our Services

- **Provide extensive training and experience** preparing professionals to solve cutting-edge informatics issues in public health.
- **Develop a curriculum** that comprises 10% course work and 90% on-the-job training in both informatics and public health.
- **Place fellows in CDC programs** where they
 - ✓ Work on federal informatics projects like the BioSense Platform and the National Notifiable Diseases Surveillance System
 - ✓ Provide technical assistance to state and local health departments and international health agencies
 - ✓ Evaluate complex public health information systems.
- **Respond to Info-Aid requests** for fellows to provide analytic support to state and local health departments.

 A graphic featuring two interlocking gears, one light green and one yellow. Overlaid on the gears is the text: "More than half of PHIFP graduates continue in public health".

More than half
of PHIFP graduates
continue in
public health

Our Work

- **Recruit PHIFP fellows** for CDC programs that need informatics expertise, using a variety of tools including social media outreach and alumni engagement.
- **Conduct a comprehensive evaluation**—including surveys, interviews, and in-person visits with fellows and host sites—to determine whether the fellowship is meeting its goals.
- **Continuously improve the program** by regularly reviewing the curriculum, recruitment process, performance of both the program and the fellows, and the evolving informatics complexities and public health informatics needs.
- **Monitor and evaluate trends** in Info-Aid requests from state and local health departments to ensure appropriate deployment of fellows with the skills to address problems.
- **Engage with partners** including alumni, state and local health departments, and national public health organizations.

Our Impact

- **Our fellows develop expertise in a much-needed field.** They learn and work with teams involved in research and development of public health information systems, and they're trained to provide technical assistance to state and local health departments and international agencies. More than half continue working in public health after their fellowships. Others find jobs in academia, health care, and the private sector.
- **Informatics expertise is critical to CDC programs in the United States and abroad.** PHIFP fellows have helped to improve the implementation of information systems and conducted informatics evaluation projects. Several fellows participated in the Ebola emergency response both at CDC and in Guinea. PHIFP supports global health informatics needs by placing fellows on strategic global health security projects in multiple countries and training country staff in informatics.
- **Ours is the first public health fellowship designated as a Department of Labor (DOL) Registered Apprenticeship.** This means that CDC PHIFP graduates earn certificates from two federal agencies. Registering the apprenticeship opens up the possibility of DOL supporting the growth of CDC fellowships. In addition, because registering the apprenticeship involved establishing a Standard Occupation Classification for health informatics, DOL can now track the growth of this field.



In addition to their CDC assignments, PHIFP fellows provide **short-term informatics assistance** to other federal agencies, state and local health departments, or global health authorities. For example, PHIFP fellow Loretta Amadi (above, left) is seen here with a data manager in a CDC office in Cairo, Egypt, conducting **workflow analysis of an information system** to improve data access and quality in the International Emerging Infections Program.

Strengthening Health Systems Through Interprofessional Education (SHINE)

Strengthening health systems to achieve improved health outcomes is a deliberate process. It involves the public health and healthcare systems creating a **workforce that spans boundaries and disciplines**. This interprofessional workforce can implement many changes critical to improving overall population health in communities across the nation. SHINE addresses the need for enhancing **public health informatics and workforce capacity** in health systems by connecting local and federal population health workforce development efforts.

This collaborative project—funded by CDC in partnership with the **Council of State and Territorial Epidemiologists** and the **National Association of County and City Health Officials**—sponsors **three complementary fellowships** that target public health workers at different stages in their careers. These fellowships are united by SHINE's commitment to bringing systems and disciplines together to achieve sustained improvements in overall health.



Our Services

We **develop, implement, and evaluate curricula** focused on informatics, health systems integration and transformation, and community engagement to train the public health workforce. SHINE fellowships strengthen state and local health departments by creating a platform for integrating public health and health systems. We use informatics, systems thinking, problem solving, and leadership to transform systems. Our three programs are

- **Applied Public Health Informatics Fellowship (APHIF)**, a 1-year training program in informatics for graduates with a **doctoral or master's level degree** in public health informatics, or a degree in epidemiology, statistics, computer science, or related field with **applied informatics experience** or an informatics certificate.
- **Health Systems Integration Program (HSIP)**, a 1-year fellowship for **public health professionals with doctoral or master's degrees** that is designed to strengthen the links between public health and healthcare.
- **Informatics Training in Place Program (I-TIPP)**, a 1-year fellowship that helps **health department employees** gain knowledge and skills in informatics while they remain on their jobs. I-TIPP fellows get experience solving problems in informatics areas such as electronic health records, meaningful use of health data, and integrating health systems.

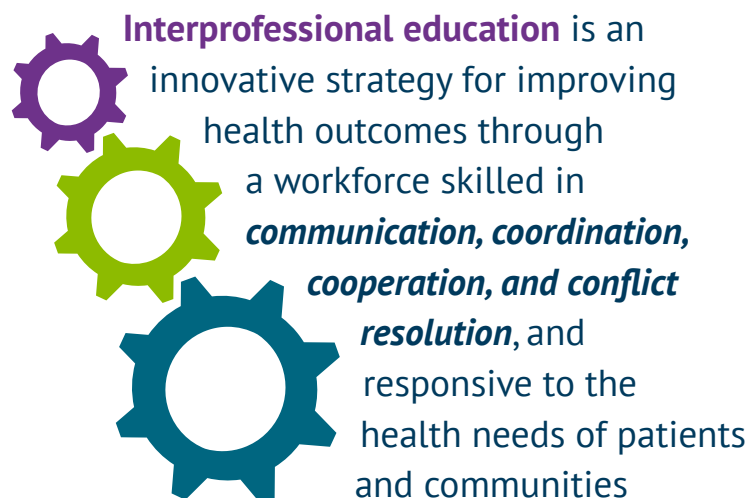


Our Work

- Attract qualified applicants through **coordinated marketing and communications activities** with our public health partners. Our messaging emphasizes the importance of leveraging the evolving informatics and epidemiology landscape to achieve health systems and public health integration goals.
- Engage partner networks—including alumni, host sites, the U.S. Department of Labor, universities, and public health and healthcare professional associations—to help develop the **strategic framework** for SHINE programs.
- Assess all aspects of SHINE on a regular basis to ensure **continuous quality improvement**. This information helps us fine-tune our fellowships to provide a high-quality experience and meet current public health workforce needs. Assessment consists of
 - ✓ An annual review of the recruitment, funding, and curriculum development process
 - ✓ Evaluation of our fellows' learning experiences
 - ✓ Analysis of the informatics needs of the current workforce.

Our Impact

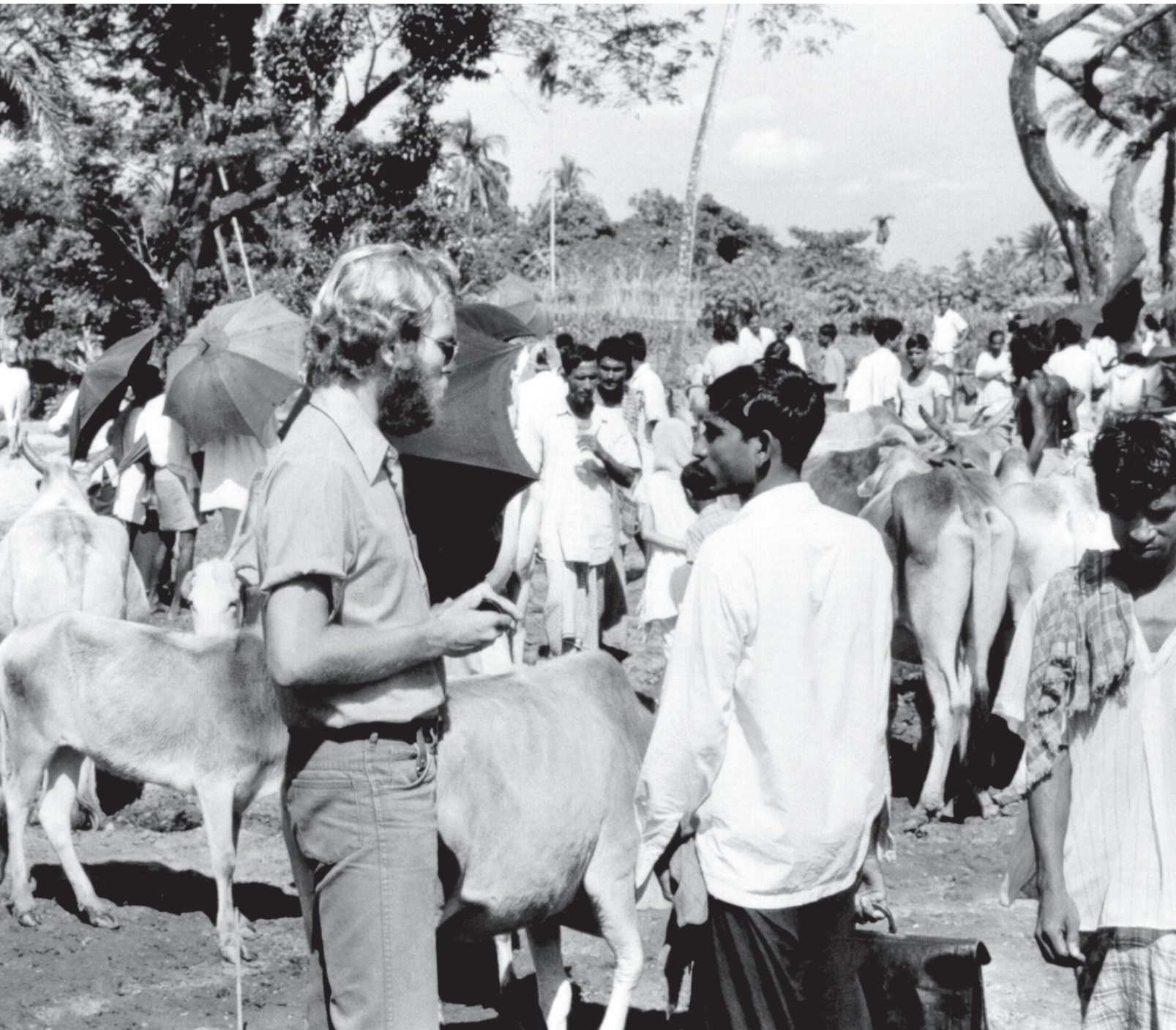
- **Our fellows fill important gaps in the public health workforce—both during their fellowships and afterward.** There's a need for greater numbers of well-trained population health professionals in a wide variety of settings. The SHINE fellowships, with their state and local emphasis, complement other CDC fellowships designed to enhance the workforce at federal and nonfederal organizations. SHINE fellows complete projects that meet real-world needs during their fellowships and bring much-needed skills in integration and informatics to their careers.
- **We develop informatics-savvy population health professionals.** Two of the SHINE fellowships focus on informatics—an area of growing importance to healthcare and public health agencies. SHINE provides training and hands-on experience in informatics, helping to meet the nation's increasing and urgent need for practice-ready experts in this area.
- **SHINE is a model for efficiency through collaboration.** Our three fellowship programs leverage funding, share resources, and develop course materials collaboratively, enabling us to maximize the opportunities available to our fellows and partners.



SHINE is an interdisciplinary, collaborative approach to educating the future public health workforce that uses an **interprofessional education and community approach**.

SHINE fellows include

- Entry- to mid-level health department employees
- Practitioners with a doctoral or master's degree
- Recent doctoral or master's level graduates.



This image shows former CDC Director Dr. Jeffrey Koplan on a field assignment in Bangladesh during the worldwide smallpox eradication effort in the 1970s. Dr. Koplan was an Epidemic Intelligence Service (EIS) Officer, Class of 1972. Established in 1951 and now part of CSELS, EIS is one of CDC's flagship programs.



Office of the Director

Overview

Our Mission: To manage, direct, coordinate, and evaluate all CSELS activities

Our Services

- **Guide** CSELS policy formation, scientific oversight, and program planning and development.
- **Identify** program priorities through strategic planning.
- **Review and evaluate** program data for opportunities to make CSELS more effective.
- **Coordinate** CSELS science, communication, policy, and business management activities.
- **Create** an organizational framework to strengthen public health laboratory science, policy, and practice within CDC and at local, state, and global levels.
- **Establish** a coordinated approach to address cross-cutting issues in laboratory policy, science, and practice, and coordinate program and laboratory integration.
- **Recruit** strong, credible, dynamic leaders and staff to CSELS to demonstrate the scientific credibility and value of our programs to internal and external partners through research, consultation, service, and innovation.
- **Develop** a highly collaborative service culture within CSELS, and between CSELS and other CDC programs, to maximize our value to the agency and its partners.
- **Collaborate** with CDC, HHS, other federal agencies, and external public health partners.

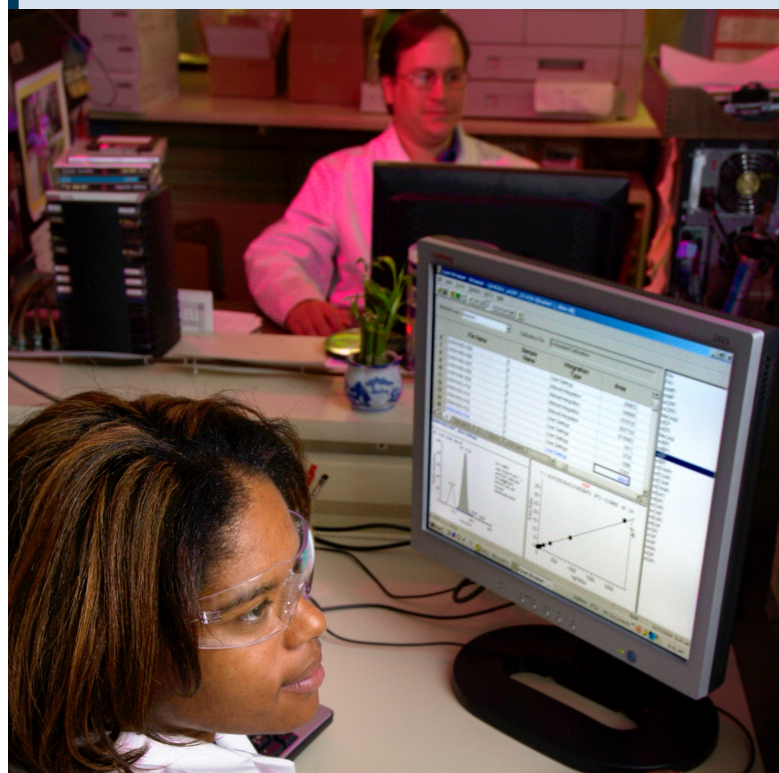
Our Activities and Programs

Activities

- Science
- Policy
- Communication
- Business Management

Programs

- CDC Biosurveillance Coordination Activity
- Health Information Strategy Activity
- Program Integration Unit (PIU)
- Surveillance Data Platform (SDP) With Shared Services



Our Activities

Science

We oversee scientific quality and integrity within CSELS.

Our focus is to

- Provide resources and support for CSELS scientists
- Assure adherence to CDC and federal regulations and policies in conducting research and disseminating data
- Sponsor seminars for CSELS staff
- Provide leadership in determining the scientific direction of CSELS programs
- Conduct peer reviews of CSELS scientific programs.

Policy

We provide leadership in policy analysis and strategy, legislative affairs, and partnership engagement.

Our core functions are to

- Develop CSELS annual budget submissions
- Respond to requests for information from CDC, federal leadership, legislators, policymakers, and the public
- Communicate and collaborate with partners to support senior leadership, facilitate program development, and promote CSELS priorities
- Review CSELS documents to ensure that they reflect CDC policies and positions, and that policy implications are communicated clearly, consistently, and accurately.

Communication

We provide timely and effective communication services that promote CDC's national efforts.

Our goals are to

- Establish, evaluate, and maintain efficient processes for the development and dissemination of effective communication products and activities for CSELS
- Foster collaborative relationships for communication activities among and between CSELS organizational units and their stakeholders
- Create and disseminate high-quality communication products relevant to CSELS mission, goals, objectives, and stakeholder audiences.

Business Management

We provide business support services to ensure that CSELS divisions can continually deliver program excellence.

We manage the following

- CSELS budget execution and Working Capital Fund operating costs
- Human resources and training
- Workforce development and wellness
- Information technology and security
- Travel, logistics, and contract management.

CDC Biosurveillance Coordination Activity

We focus on optimizing secure sharing and integration of CDC program information and health-related data with federal government partners—to foster strategic decision making, coordinate activities, guide resource use, and pursue collaborative opportunities. By improving access to public health surveillance data, we strengthen capabilities for early detection and rapid characterization of public health threats. This allows federal, state, and local health departments to make informed decisions and take effective action.

Our Services

- Work in partnership with CDC programs, other federal agencies, and state and local health departments to provide public health surveillance information that informs **national policy and priorities**.
- Foster the sharing of public health surveillance and outbreak information to support **mission-critical decision making** by partners across the federal government.
- Support and advance the mission of public health surveillance at all levels of government through critical **evaluation of systems** and **publication of results**.

Our Work

- Lead, represent, and coordinate **CDC's input, perspective, and priorities** on interagency, multilateral, and executive-level activities.
- Use **highly networked partnerships** across CDC and the federal government, as well as state, local, tribal, and territorial health departments.
- Publish clear, concise, and **transparent communications** to improve biosurveillance practices.
- Leverage **subject matter expertise** and use sound scientific judgment to help partners achieve their missions.



Our team coordinates and contributes to reviews and reports, including the

- Office of Science and Technology Policy Biodefense review
- Joint External Evaluation/Global Health Security Agenda
- HHS strategic objective review
- President's Council of Advisors on Science and Technology reports.



Our Impact

- **Effective and secure information sharing among federal agencies is crucial for mission-critical decision making.** In partnership with the National Biosurveillance Integration Center, we are revising the interagency request for information process and protocols. The updated process will
 - ✓ **Provide context** for the requests, including why the information is needed
 - ✓ **Assign priority** to the requests to improve the timeliness of responses
 - ✓ **Reduce the burden** on programs and subject matter experts by focusing the questions to only information needed by the requestor.
- **We put discussion of local capabilities and capacities at the center of every conversation.** The local level is where public health happens. Strengthening surveillance and workforce capacities helps state and local health departments address the needs of their jurisdictions. It also helps them respond to the low-probability, high-consequence events biosurveillance was created for.



Public Health Surveillance Is the Backbone of Biosurveillance

While **biosurveillance** considers information from across various sectors—human, animal, and environmental health—the foundation for early detection and situational awareness is the ongoing systematic collection and analysis of data that public health officials use to prevent and control a disease. It is strong **public health surveillance** capabilities at the state, local, tribal, and territorial levels that enable a strong biosurveillance network.

Health Information Strategy Activity

We lead the work, education, communication, and coordinated activities that engage CDC in electronic **health information exchange**—particularly the Medicare and Medicaid Electronic Health Record (EHR) Incentive Program, also known as **Meaningful Use**. Our focus is on the future and using EHRs to improve public health **case reporting**—the foundation of disease tracking and monitoring.

Our Services

- Work in partnership with CDC programs, other federal agencies, and state and local health departments to provide **technical assistance and education** on Meaningful Use.
- Support public health jurisdictions in managing **disease reporting**.
- Help increase **interoperability**—the ability of systems to talk to one another and share data—between public health and partner systems, and leverage best practices to share data among stakeholders.



Our Work

We accomplish our work through three central programs

- **EHR Meaningful Use Program.** Through this program, we partner with the Office of the National Coordinator for Health Information Technology to set national initiatives, establish communities of practice, and support and expand public health-related objectives on Meaningful Use. We also liaise with federal advisory committees about changes in Meaningful Use that may impact public health.
- **Reportable Conditions Knowledge Management System (RCKMS).** This system provides state and local health departments with comprehensive information about the “who, what, when, where, and how” of reporting disease cases to federal, state, and local authorities. RCKMS serves as an authoritative real-time portal to make reporting more accurate and timely.
- **Public Health Tiger Team.** To build our reputation as a trusted source for the public health community, our Tiger Team has worked to harmonize standards across public health use cases and programs, educate the community on informatics issues, and monitor and participate in national initiatives on interoperability.

Our Impact

- **Electronic case reporting (eCR) has substantial promise for the future of disease tracking in the United States.** Historically, the process of sharing potential cases of reportable diseases with state and local health authorities has been paper-based. This process limits the timeliness and completeness of the information and puts a significant burden on both clinical reporters and health agencies. eCR generates and transmits information on potential cases of reportable conditions from the EHR. It has the potential to provide
 - ✓ **More complete and accurate case reports in real time**, which allows health officials to act sooner
 - ✓ **Earlier detection of cases**, which permits earlier intervention and reduces disease transmission
 - ✓ **Improved detection of disease outbreaks**, which allows health authorities to investigate sooner and discover earlier what fuels the outbreaks
 - ✓ **A new infrastructure to rapidly respond to new and emerging health conditions**, which helps health authorities gather information for action and give feedback to providers.
- **eCR requires a collective commitment among healthcare partners.** Our vision is for a nationally interoperable system for eCR that allows for timely sharing of information between state and local jurisdictions. The technical aspects of implementing eCR are solvable. We need public health, healthcare, and EHR vendors to work together to build eCR in the United States in a way that is secure and scalable. CDC, the Council of State and Territorial Epidemiologists, Association of State and Territorial Health Officials, Association of Public Health Laboratories, and Public Health Informatics Institute have come together to explore and begin implementing eCR. This group of partners has already made progress on important elements of the technical framework including initial standards, platform structure, tools, and guides.

Health IT to Advance Public Health

Health IT is evolving rapidly. CDC must play a leadership role in its development to ensure it meets the public's health needs. Our involvement in national efforts puts public health on the table when new health IT initiatives are being developed. We've ensured that public health concerns are reflected in federal health IT programs, initiatives, rules and regulations, reports, and communications. We've expanded the public health data exchange objectives in the Meaningful Use regulations and helped to increase the number of providers meeting these objectives.



Program Integration Unit (PIU)

PIU is the CSELS **central hub and rapid response unit** in the Office of the Director. We identify strategic, **win-win partnership opportunities** for CSELS and CDC-wide programs and external partners (such as nongovernmental organizations and state and local health departments). We respond to urgent national, state, and local public health priorities and collaborate with programs, partners, and preparedness groups to coordinate action. CSELS looks to us to ensure that our common public health goals are met while getting the most efficient and effective use of increasingly limited resources. PIU prides itself on being the center's well-oiled machine that works behind the scenes to ensure that programs progress smoothly and successfully.

Our Services

- **Identify** new opportunities for partnerships, collaboration across programs, leveraging resources, and coordination of common activities.
- **Identify and create** new forums for sharing information about opportunities for program integration among CSELS divisions, and for strengthening linkages for sustained partnerships with internal and external partners.
- **Coordinate** and **prioritize** funding across all CSELS programs.
- **Increase** the center's readiness to respond to existing and emerging threats.
- **Serve as** the CSELS point of contact for the CDC Emergency Operations Center and the CDC Foundation.
- **Manage** CSELS umbrella cooperative agreement portfolios with major CDC partner organizations to ensure performance, accountability, and responsible use of resources.



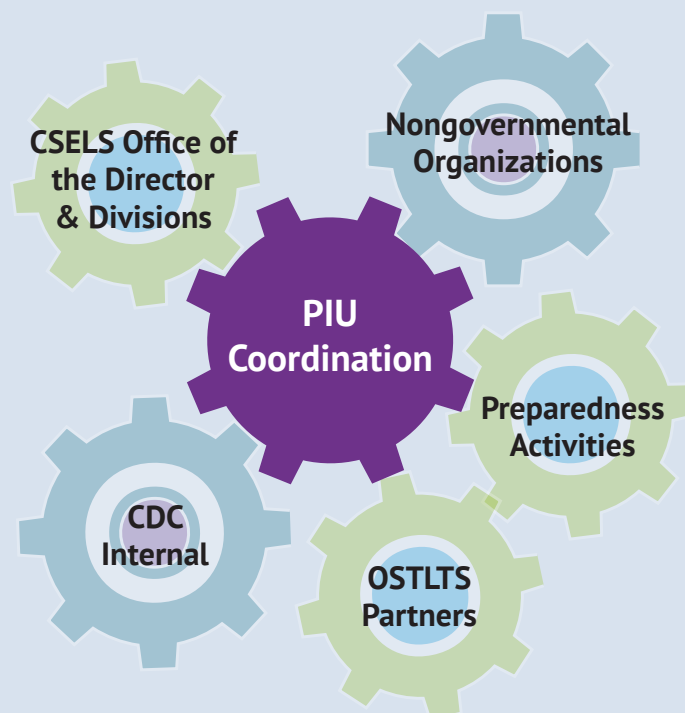
Our Work

- Promote transparent communication **within and outside CSELS** to keep everyone up-to-date on the center's activities.
- Develop **common reporting mechanisms** for CSELS program activities, as well as procedures for information sharing among CSELS divisions.
- Establish, maintain, and implement the CSELS' **Continuity of Operations Plan (COOP)**.
- Implement an **Enterprise Content Management** system to deliver information more effectively.

Our Impact

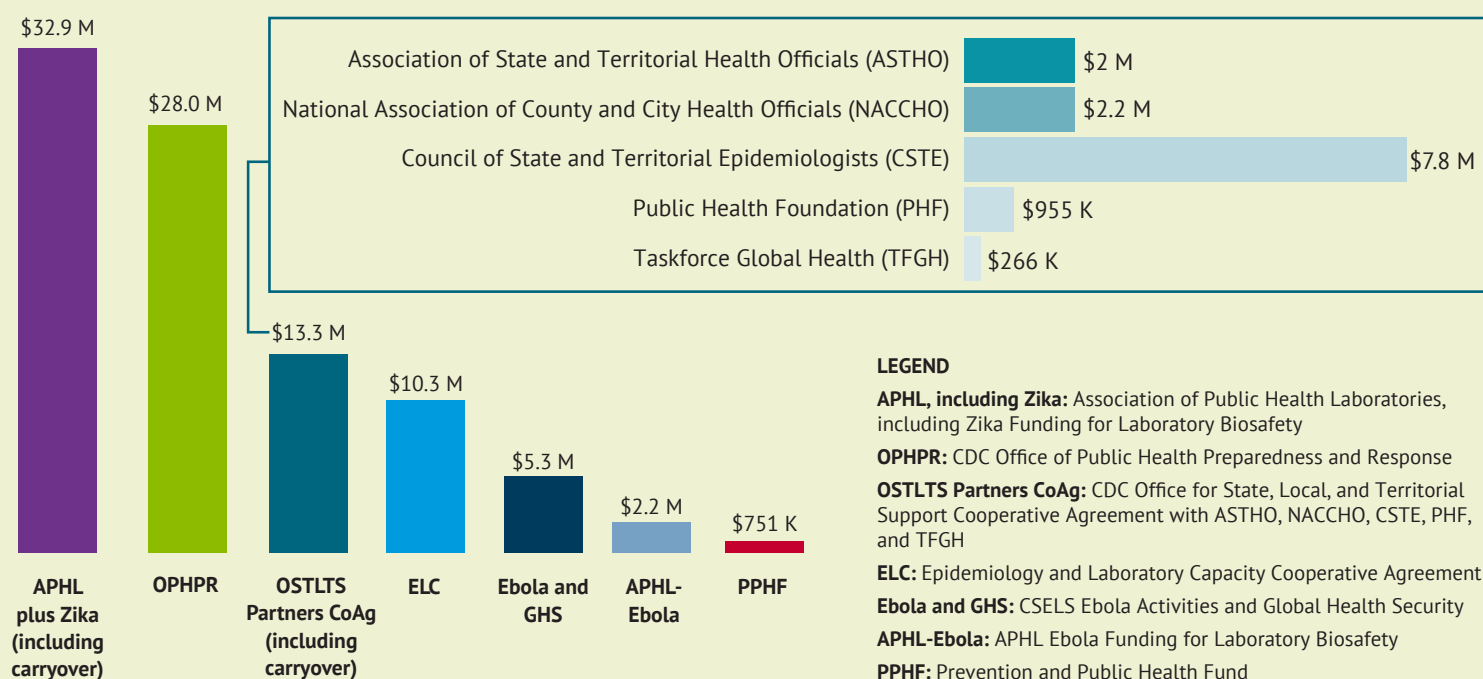
- **PIU is the central coordinating unit for CSELS cross-cutting activities.** A large and diverse center like CSELS with a wide array of programs and stakeholders that work toward shared goals needs strong organizational support. PIU is the catalyst for that. Our work behind the scenes keeps the center's programs running smoothly, projects moving forward, priorities focused, and our staff informed of activities and accomplishments across divisions.
- **We manage and provide oversight for a large portfolio of funding resources for CSELS external and special initiative programs.** We've cross-trained staff and increased site visits to public health partners to ensure that limited funds are used efficiently to meet public health needs. We've also increased our capacity to obtain external funding for CSELS programs. By enhancing communication and collaboration throughout CSELS, we ensure that divisions know about CDC-wide funding opportunities.

PIU: The CSELS Coordination Hub



CSELS FY2016 Funding Portfolio Managed by PIU

In FY2016, external funding for CSELS cooperative agreements and other programs totaled around **\$92.8 million**.



Surveillance Data Platform (SDP) With Shared Services

CDC's mission to protect and support population health requires vigilant, effective, and responsive surveillance of public health data—and collaborative agility is needed throughout the surveillance process. By working together, CDC and its public health partners at local, regional, state, territorial, tribal, national, and international levels can more swiftly, accurately, and efficiently track and respond to critical health trends and threats.

In 2014, CDC unveiled a Surveillance Strategy to improve its public health data surveillance capabilities by consolidating systems, eliminating redundancies in reporting, and reducing reporting burdens on its public health partners. CDC launched the Surveillance Data Platform (SDP) With Shared Services as part of these capability-building efforts in 2016.



Our Services

- **Reduce** the number of independent, stand-alone public health information and surveillance systems.
- **Enhance** CDC and partner abilities to securely parse, prepare, and share data.
- **Optimize** local, regional, national, and international public health response time.
- **Provide** crosscutting initiatives to improve data availability and usability and to incorporate advanced information technology (IT) solutions.
- **Improve** the interoperability of CDC surveillance activities with electronic health records and other health IT systems.
- **Enhance** accountability, resource use, and innovation in surveillance.
- **Accelerate** the use of emerging tools for a more nimble public health system.

SDP will provide a platform and set of shared services that support the ability to deploy and share existing services. These “shared services” are defined as people, processes, or technologies that fulfill a common need or request. This platform will enhance CDC's ability to collect, manage, analyze, and disseminate data while reducing the burden on CDC partners. **The ultimate goal: to optimize public health surveillance.**

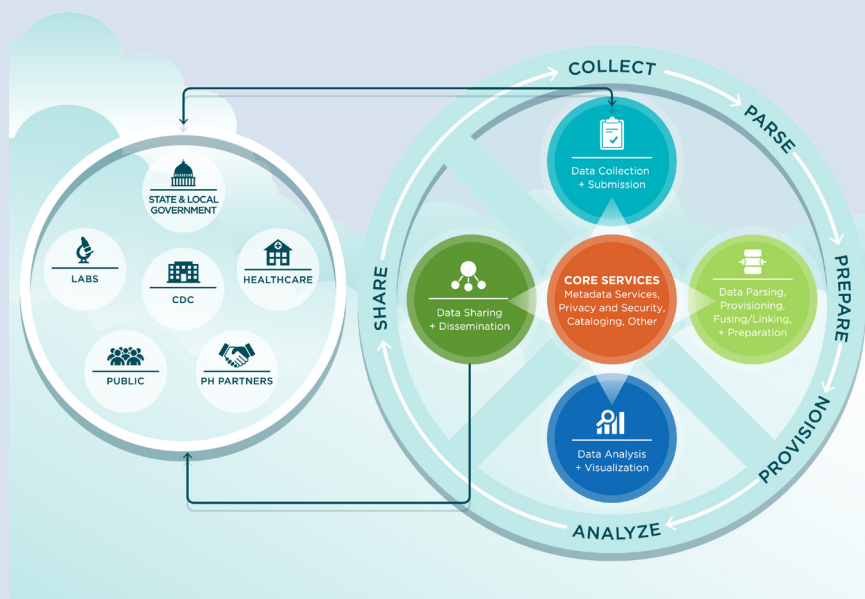
Our Work

- Apply an agile approach to platform and services development to ensure an iterative, user-centered process that engages all partners inside and outside CDC.
- Develop a platform of services that enhances the ability to collect, manage, analyze, and disseminate data.
- Provide data analysis and visualization tools, common metrics, indicators, and reference data.
- Enable access to specific data elements, cleanse and validate data, and integrate data sources.
- Perform analytics and generate data visualizations.

Our Impact

- We protect and promote population health and improve response time to critical health threats by making public health data surveillance more efficient for CDC and its public health partners.
- We enhance CDC and public health partner abilities to securely analyze, prepare, and share data.
- We reduce the costs of previously isolated surveillance systems through a systems-level, modernized, “opt-in” solution.
- We make it easier for CDC programs and public health partners to report disease outbreaks and other health threats.

SDP builds the foundation for a future in which CDC scientists can assemble services to create new capabilities in near real-time, allowing a more flexible and robust response to public health emergencies.



Learn more about SDP With Shared Services
www.cdc.gov/sdp

Learn more about CDC's Surveillance Strategy
www.cdc.gov/surveillance



Workers in Columbus, Georgia, erect a billboard to promote polio vaccinations in the community. This campaign was produced by the former U.S. Department of Health, Education, and Welfare and CDC (operating as the Communicable Disease Center), in cooperation with the Georgia Department of Public Health and the Muscogee Health Department. Partnerships like these are critical for health prevention efforts. Public health officials in the 1950s used every type of media available to promote the polio vaccination. By 1960, the number of polio cases dropped to about 3,000; by 1979 there were only about 10.



The Road Ahead

The Road Ahead

Today's Challenges, Tomorrow's Innovations

In 70 years as the stewards of the nation's health, CDC has encountered constant challenges. By facing and embracing these challenges, CDC and its centers and programs stay at the top of their game, improving and innovating the way we address the nation's priority health concerns. In that tradition, CSELS has taken on a number of emerging issues and used them as flagstones to finding new scientific solutions. Here is how we are addressing our most critical challenges to keep moving ahead.

EMERGING HEALTH THREATS

The health story dominating the news in 2014 was the unprecedented Ebola virus outbreak in West Africa, which took the lives of more than 11,000 people. Among the victims in the United States were two people who came to the country with Ebola (one of whom died from the disease) and two healthcare workers who contracted Ebola on the job. Although the disease did not spread in the United States, it was a reality check for our healthcare system. The health and safety of Americans is inextricably linked to the health and safety of the rest of the world. Our most important lesson from the Ebola epidemic: preparedness can stop disease threats—even when the disease is fast-moving and deadly.



In 2016, CSELS again mobilized a coordinated emergency response to help CDC act on the newest health threat: Zika virus. Our **Program Integration Unit** organized these efforts, setting up a Zika task force to keep leadership informed. The **Epidemic Intelligence Service (EIS)** has long been the go-to resource in emergencies. EIS officers have once more been CDC's "boots on the ground" during the Zika response, in the United States and around the world. Up-to-date information about the spread of Zika virus and prevention guidelines have been reported to the public health community through the ***Morbidity and Mortality Weekly Report (MMWR)***. CSELS informatics tools—such as Epi Info™ and the **Public Health Information Network's Vocabulary Access and Distribution System**—are critical elements in sharing timely information about the virus with local public health agencies. Based on lessons learned from Ebola, we've also brought in our **health information technology** and **Meaningful Use** experts to devise tools that guide healthcare providers in assessing Zika virus symptoms and selecting diagnostic tests. CSELS helps CDC get the facts, make decisions based on current science, and tell people what we know when we know it to protect the health of Americans.



Threats like Ebola and Zika virus are why CSELS is investing in efforts to bulk up the nation's ability to respond rapidly and efficiently to disease outbreaks, natural disasters, and other health threats. EIS officers—CDC's team of "disease detectives"—will remain the front line first responders. But fellows from newer training programs like the **Informatics Training in Place Program (I-TIPP)** and the **Applied Public Health Informatics Fellowship (APHIF)** are now stepping in, especially to provide critical informatics expertise for urgent short-term needs in communities across the United States. *MMWR*—which has long been "the voice of CDC"—will continue providing timely reports of disease outbreaks. In its ongoing coverage of Ebola, *MMWR* published more than 50 additional reports between June 2014 and December 2015.

CSELS will continue to test and refine cutting edge tools to aid field workers in remote locations, such as the **Epi Info Viral Hemorrhagic Fever Application**—a software tool that helps find people exposed to the deadly virus faster. CSELS is also looking to new frontiers in science and medicine to help us prepare for threats at home and abroad. We're seeking funding under the government's **2015 Global Health Security Agenda** to design and conduct research studies on the Ebola virus. We aim to use the latest **genome-based technologies** to better understand the virus—who is most susceptible, how it naturally progresses—to improve global tracking, monitoring, and control of future outbreaks.

LABORATORY SAFETY

CDC laboratories routinely work with some of the deadliest germs in the world—identifying health threats and conducting vital public health research. In 2014, there were several incidents involving research samples of anthrax, influenza H5N1, and Ebola virus at CDC laboratories. Comprehensive internal and external reviews were conducted of each incident, and workgroups reviewed the agency's laboratory safety procedures and protocols. Although the incidents posed no risk to the public, CDC has been taking steps to improve laboratory safety across the agency.

As part of the agency-wide safety initiative, CSELS established the **Laboratory Leadership Service (LLS)**. This new fellowship program is aligned with one of our strategic goals—to prepare the health workforce. LLS is focused on developing early-career laboratory scientists for future leadership and management positions. The program emphasizes skill-building in biosafety and develops public

health leaders who integrate laboratory safety and quality as a standard of practice in every facet of their work. The first class of seven LLS fellows began the 2-year program in July 2015. In 2016, LLS fellows had participated in several Epi-Aids to support CDC's Ebola and Zika response efforts. In 2017, CSELS will assign an LLS fellow to a state or local public health laboratory.

In 2015, we also piloted the first **Virtual Knowledge Assessment** for the Laboratory Response Network—a group of 150 federal, state, local, and other laboratories coordinated by CDC. Our pilot assessment—offered at no cost to the laboratories—covers “rule-out-or-refer” procedures. It tests laboratory scientists’ ability to make accurate interpretations of laboratory tests and procedures to identify potential bioterrorism agents. Based on the success of this pilot, we plan to develop similar assessments for topics such as biosafety, biosecurity, and hazardous material packaging and shipment.



THE CHANGING HEALTHCARE LANDSCAPE

With the constant introduction of new technologies, practices, and specialties, as well as people’s evolving healthcare needs, it can be challenging for students and professionals to keep up. But having a nimble, well-prepared workforce that can collaborate across disciplines is critical to improving the health of our communities—and the nation as a whole.

The laboratory isn’t the only place where CSELS is making critical investments in the workforce of today and the workforce of the future. The **Population Health Workforce Initiative (PHWI)** leads the way in building a competent corps of professionals that can bridge the gap between individual care and population health. Programs like **Career Paths to Public Health** aim to get students thinking about public health careers as early as middle school, while programs like **Informatics Support for Collaborative Applied Learning Environments (I-SCALE)** and the **CDC-Hubert Global Health Fellowship** provide practical experience for college students and medical or veterinary students respectively. Through our accredited **Preventive Medicine Residency**, medical school graduates can get a unique training experience that combines their clinical skills with expertise in population health. In 2014, we added a track for **Presidential Management Fellows** with a background in science, technology, engineering, and math (STEM) disciplines, enabling CDC to hire a more diverse group of workers and address a critical skill gap.

The Affordable Care Act (ACA) has been a pivotal driver in the ongoing transformation of our healthcare system. At the heart of the ACA is a move toward coordinated care—bringing together public health agencies, healthcare systems,





and communities to improve health. CSELS is doing our part to bring about this transformation by focusing on the interface between health care and public health and making sure the workforce is up to the task. Since 2015, we have given fellows in different CDC programs and disciplines the chance to support a population health initiative within a local health department to demonstrate its value in population health. PHWI and the fellowships that support it—like the **Population Health Training in Place Program**, **Health Systems Integration Program**, and **Preventive Medicine Residency and Fellowship**—bring health departments and health systems more closely together to improve community health. The initiative supports health departments in achieving population health goals, develops fellows' skill sets to address gaps within health departments, and helps bolster workforce capacity in population health.

INFRASTRUCTURE UPGRADES

The **National Notifiable Diseases Surveillance System (NNDSS)** is a nationwide collaboration that enables all levels of public health—local, state, territorial, federal, and international—to share notifiable disease-related health information. Public health professionals use this information to monitor, control, prevent, and notify CDC about infectious disease and other health conditions. It is important to track these diseases and conditions in order to prevent or reduce the effects of a widespread outbreak.

NNDSS is the crux of our public health system. Without it, we wouldn't be able to spot and take action when disease outbreaks occur. But the system is based on aging technology. By taking advantage of new technologies and standards for sharing data, CDC now has the opportunity to strengthen and modernize the infrastructure supporting NNDSS. Led by CSELS as part of CDC's agency-wide Surveillance Strategy, the **NNDSS Modernization Initiative** is underway to enhance the system's ability to provide more comprehensive, timely, and higher quality data than ever before.

In 2016, CSELS assumed responsibility for another key part of CDC's Surveillance Strategy: the **Surveillance Data Platform With Shared Services**. This platform and set of shared services—people, processes, or technologies—will enhance CDC's ability to collect, manage, analyze, and disseminate data on diseases and other health threats with minimal burden on CDC partners. **Epi-Info™** will also release a new platform that allows public health practitioners to enter and manage data from multiple locations.





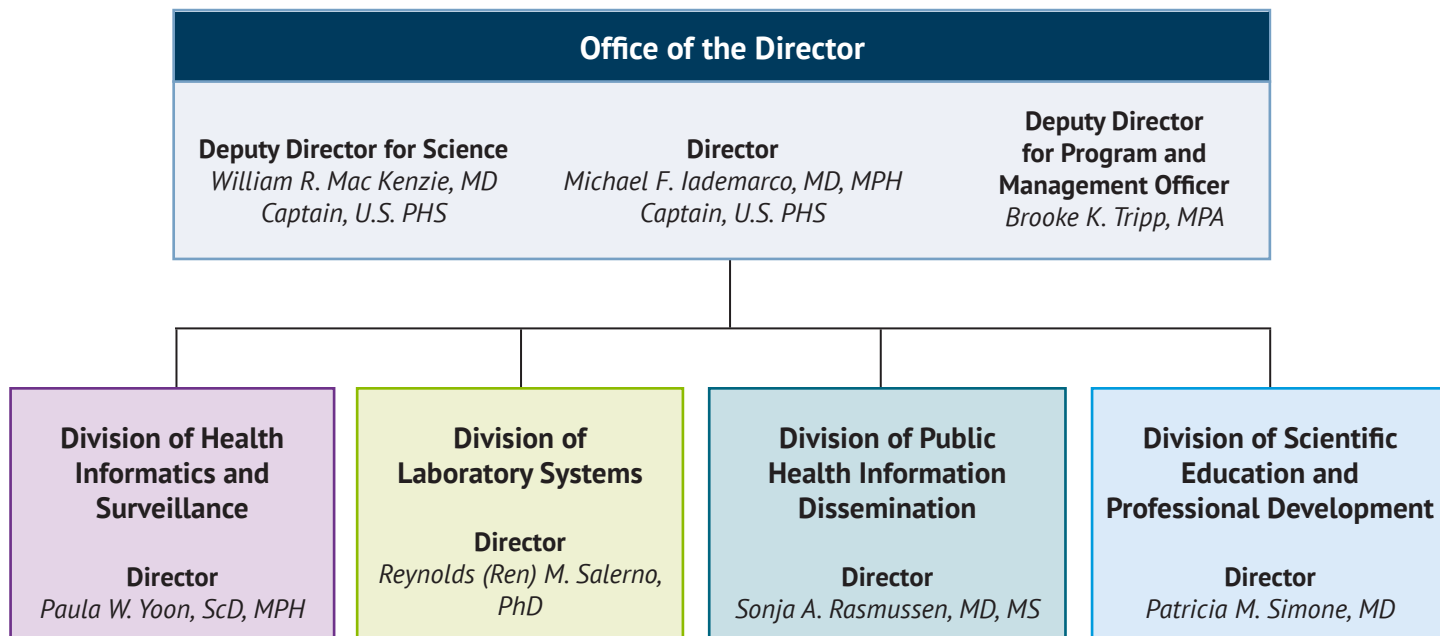
This is a containment map—a tool used in epidemiology during a disease outbreak to track cases and determine who in the community had potentially been exposed. The keeping of detailed records is a hallmark of epidemiologic science. It was critical in efforts to eradicate smallpox around the world. Today, electronic tools like Epi Info™ make mapping faster and easier and allow for more robust disease tracking.



Our Leadership

Center Leadership

Center for Surveillance, Epidemiology, and Laboratory Services (CSELS)



Director: Michael F. Iademarco, MD, MPH
Captain, U.S. Public Health Service



Dr. Michael Iademarco is Director of the Center for Surveillance, Epidemiology, and Laboratory Services (CSELS) at the U.S. Centers for Disease Control and Prevention (CDC). His expertise as a physician-scientist and laboratorian provides a strong foundation to lead CDC's efforts to track America's health, strengthen laboratory networks, and help public health officials identify urgent health threats.

Prior to this appointment, Dr. Iademarco served as Laboratory Branch Chief of CDC's Division of Tuberculosis Elimination, where he oversaw clinical laboratory referral services and helped strengthen laboratory capacity building. From 2006 to 2010, he was the Department of Health and Human Services Health Attaché at the U.S. Mission in Vietnam, where he coordinated U.S. health activities for the Embassy and was the in-country representative for the Office of the Secretary. In 2011, Dr. Iademarco was awarded a Government of Vietnam medal by the country's prime minister

in part for his work against HIV/AIDS. In addition, he served as Associate Director for Science for the Division of Tuberculosis Elimination, where he oversaw the issuance of major TB guidelines.

Dr. Iademarco obtained his undergraduate degree from Franklin & Marshall College, medical degree from the University of Virginia, and master's degree in public health from Saint Louis University. He trained clinically and in research at Temple University Hospital in internal medicine and Barnes-Jewish Hospital in pulmonary medicine. Prior to joining CDC, he was a faculty member of Washington University in St. Louis. Currently, he is an adjunct faculty member of Emory University and serves as an attending physician at the Atlanta Veterans Administration Medical Center Medical Intensive Care Unit.

Deputy Director for Science: William R. Mac Kenzie, MD
Captain, U.S. Public Health Service

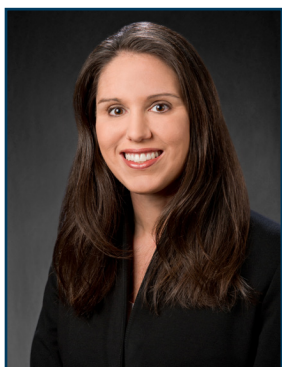


Dr. Mac Kenzie has had a distinguished career at CDC and serving state and local public health organizations. As the Supervisory Medical Officer and Team Lead within the Clinical Research Branch of CDC's Division of Tuberculosis Elimination, he led studies on the treatment of drug-susceptible and drug-resistant tuberculosis. He also helped guide the future direction of the Clinical Research Branch and substantially influenced the direction of the Division of Tuberculosis Elimination over the coming years.

Dr. Mac Kenzie began his service at CDC as an Epidemic Intelligence Service (EIS) Officer assigned to the Wisconsin Division of Health. As an EIS Officer, he led the investigation of an outbreak of cryptosporidiosis in Milwaukee—the largest documented outbreak of waterborne disease ever linked to a public water supply in the United States. Later, he supervised and trained more than 30 EIS Officers and engaged in emergency preparedness and response planning at CDC. Dr. Mac Kenzie has substantial international public health experience, including work with the International Rescue Committee in Kosovo where, in collaboration with local officials and WHO, he led in rebuilding the public health system.

Dr. Mac Kenzie received his medical degree from the University of California, San Francisco, trained in internal medicine and pediatrics at the University of Arkansas for Medical Sciences, and completed a fellowship in infectious diseases at Stanford University. He is a winner of the Alexander D. Langmuir Prize and the Philip S. Brachman Award.

Deputy Director for Program and Management Officer: Brooke K. Tripp, MPA



Ms. Tripp provides strategic leadership, management, and oversight of CSELS operations. She directs the day-to-day management of approximately 700 staff and contractors and a budget of more than \$197 million. She serves as a senior advisor to the CSELS Director.

Ms. Tripp joined CSELS on a detail in April 2014 and became the permanent Management Officer in August 2014. Since joining the center, she has led the development and implementation of a CSELS-wide strategic plan, led a programmatic review of all CSELS programs for efficiencies and performance metrics, addressed critical workforce needs including the recruitment and retention of a diverse workforce, and developed and implemented a communications plan for the center.

Prior to joining CSELS, Ms. Tripp served as the Office of Safety, Security, and Asset Management and the Office of Security and Emergency Preparedness Management Official. Ms. Tripp began her career at CDC as a Presidential Management Fellow in the Financial Management Office's Congressional Legislative Branch.

Ms. Tripp received her undergraduate degree in organizational communications and political science from The University of North Carolina at Chapel Hill. She received her master's degree in public administration from the University of Georgia, focusing her studies in finance and budget and human resources.

Division Leadership

Director, Division of Health Informatics and Surveillance: Paula W. Yoon, ScD, MPH



Dr. Yoon became Director of the Division of Health Informatics and Surveillance in June 2014. In this position, Dr. Yoon provides leadership and oversight of activities that support two national surveillance programs (National Notifiable Diseases Surveillance System and National Syndromic Surveillance Program); information system development for data collection, exchange, and processing; and a Data Hub that provides access to health-related data sources used for research and disease prevention and control.

Previously, Dr. Yoon was Director of the Division of Epidemiology, Analysis, and Library Services, CSELS. In this position, she oversaw cross-cutting programs that included measurement of population health and health disparities, access to and analytic support for the use of healthcare data for public health, Epi Info™ software development and application for epidemiologic investigations, systematic reviews of community preventive services, and access to scientific literature and reference services.

Dr. Yoon joined CDC in 1994 as an officer in the Epidemic Intelligence Service in the Birth Defects and Pediatric Genetics Branch, where she conducted investigations of birth defects and was the principal investigator of the National Birth Defects Prevention Study. She worked in CDC's Office of Public Health Genomics, where she led an initiative to evaluate the use of family medical histories as a public health strategy for disease prevention. This included the development of a web-based family history collection tool and a clinical trial to evaluate the tool in primary care practices. Dr. Yoon also led the Health Services Research and Registries Team in the Division for Heart Disease and Stroke Prevention with a portfolio that included a national stroke registry; a national cardiac arrest registry; and surveillance and research projects that assessed the impact of health services on prevention, treatment, and management of heart disease and stroke.

Director, Division of Laboratory Systems: Reynolds M. Salerno, PhD



Dr. Salerno, who became Director of the Division of Laboratory Systems in January 2016, has an international reputation for excellence in promoting the safe, secure, and responsible handling of dangerous biological agents in laboratory settings. His previous position as Senior Manager for Biological Sciences and Technologies at Sandia National Laboratories included work with laboratory quality systems, biosafety, biosecurity, biocontainment, and infectious disease diagnostics.

Dr. Salerno has advanced biorisk management in hundreds of bioscience laboratories in more than 50 countries. He is a U.S. delegate to Technical Committee 212 of the International Organization for Standardization, and has served on the board of directors of the International Federation of Biosafety Associations (and was previously its Vice Chairman). He has been a technical advisor to both the World Health Organization and the U.S. Defense Science Board's Task Force on Deterring, Preventing, and Responding to the Threat or Use of Weapons of Mass Destruction.

Dr. Salerno has served as a member of the U.S. delegation to the Biological Weapons Convention, the Dual-Use Biological Research Guidelines working group of the National Science Advisory Board for Biosecurity, and the International Criminal Police Organization's Counter-Bioterrorism Board of Experts. He has been recognized as a Next Generation fellow on U.S. Global Policy and the Future of International Institutions by the American Assembly at Columbia University.

Dr. Salerno is the coauthor of *Laboratory Biosecurity Handbook* (CRC Press, 2007) and *Laboratory Biorisk Management: Biosafety and Biosecurity* (CRC Press, 2015). Dr. Salerno is a member of the American Society for Microbiology, the American Biological Safety Association, and the Association of Public Health Laboratories (APHL). He currently serves on APHL's Biosafety and Biosecurity Committee. He received his bachelor's degree from Middlebury College, and his PhD from Yale University.

Director, Division of Public Health Information Dissemination: Sonja A. Rasmussen, MD, MS

Dr. Rasmussen became Director of the Division of Public Health Information Dissemination in January 2015. In addition to her duties as Director, Dr. Rasmussen is Editor-in-Chief of *Morbidity and Mortality Weekly Report (MMWR)* and Acting Library Science Branch Chief.

She joined CDC in 1998 and since then has provided significant scientific expertise and leadership. She held several positions in the National Center on Birth Defects and Developmental Disabilities including Medical Officer, Associate Director for Science, and Senior Scientist. While there, she worked with other experts across CDC on pandemic planning efforts for pregnant women, and these efforts guided CDC recommendations for pregnant women during the 2009 H1N1 pandemic. From 2011 to 2014, she served as Deputy Director of the Influenza Coordination Unit. Most recently, Dr. Rasmussen served as Acting Director of the Office of Public Health Preparedness and Response,

including CDC's Emergency Operations Center.

Dr. Rasmussen received her bachelor of science in biology and mathematics magna cum laude from University of Minnesota-Duluth, her master of science in medical genetics from University of Wisconsin, and her medical degree with honors from University of Florida. She completed her pediatrics residency at Massachusetts General Hospital and fellowships in clinical genetics at Johns Hopkins University and University of Florida. She is board certified in pediatrics and clinical genetics and has authored or coauthored more than 190 peer-reviewed papers.

Director, Division of Scientific Education and Professional Development: Patricia M. Simone, MD

Dr. Simone has been Director of the Division of Scientific Education and Professional Development since May 2014. Previously, she served as Principal Deputy Director of the Center for Global Health and Director of the Division of Public Health Systems and Workforce Development, providing leadership in building ministries of health capacity internationally through the Field Epidemiology Training Program and the Sustainable Management Development Program.

Dr. Simone received her bachelor of science degree from Stanford University and her medical degree from the University of Tennessee in Memphis. She completed her medical residency at Vanderbilt University and an infectious disease fellowship at University of Colorado and National Jewish Center for Immunology and Respiratory Medicine, with a focus on tuberculosis and multidrug-resistant forms. She joined CDC in 1992 in the Division of Tuberculosis Elimination, later serving as Chief

of the Field Services Branch. She has also held CDC positions as Chief of the Prevention Support Office in the Office of the Director, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention; Associate Director for Science, Division of Global Migration and Quarantine during the response to SARS; and Associate Director for Program Development, Division of Healthcare Quality Promotion.

Dr. Simone retired as a captain from the U.S. Public Health Service Commissioned Corps in 2013.



Seated at his desk is Dr. Alexander D. Langmuir (1910–1993), chief epidemiologist at CDC for 2 decades. Dr. Langmuir started the Epidemic Intelligence Service in 1951 to introduce medical and public health professionals to “shoe leather” epidemiology—an intense focus on the people and places where disease outbreaks occurred, and the precise gathering of statistics to support action.



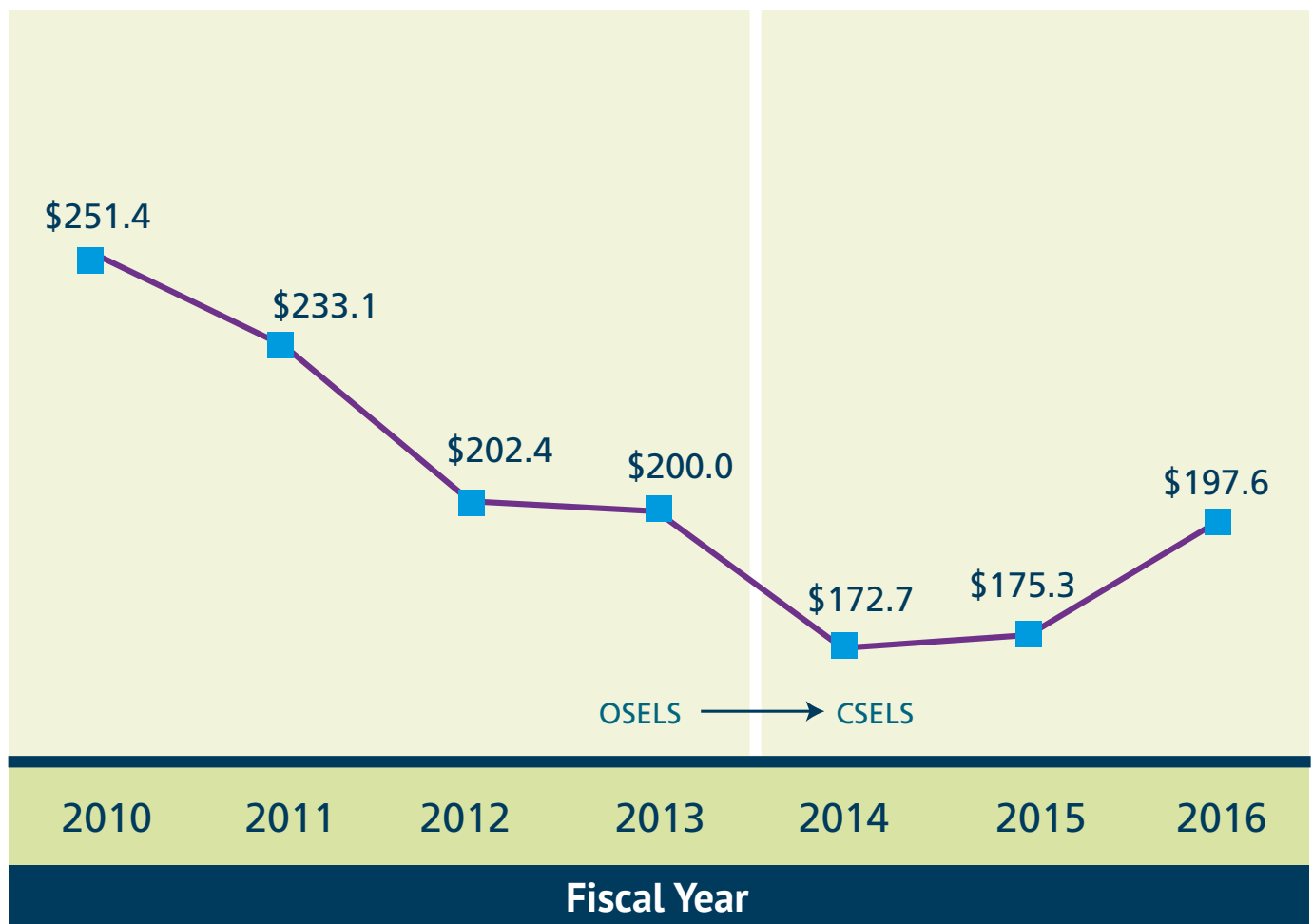
The Nation's Investment

Where Our Funding Comes From

Most of the CSELS budget is allocated through CDC's Public Health Scientific Services (PHSS) budget line. CDC's scientific services promote health, prevent disease, and prepare for health threats. As a pioneer in collecting and using health data, CDC tracks the health of populations and provides prompt data for doctors, public health workers, and government officials to respond to the most urgent health issues. This vital information is used for policymaking, health services, biomedical research, laboratory quality and safety, and improved access to health care for everyone. CDC also supports safe, state-of-the-art laboratories across the United States as an important line of defense against health threats.

This chart shows the history of our annual budget since 2010, when many of our programs were funded under the Office of Surveillance, Epidemiology, and Laboratory Services (OSELS). We have been funded as CSELS since FY2014.

CSELS Budget Ceiling History (in Millions)

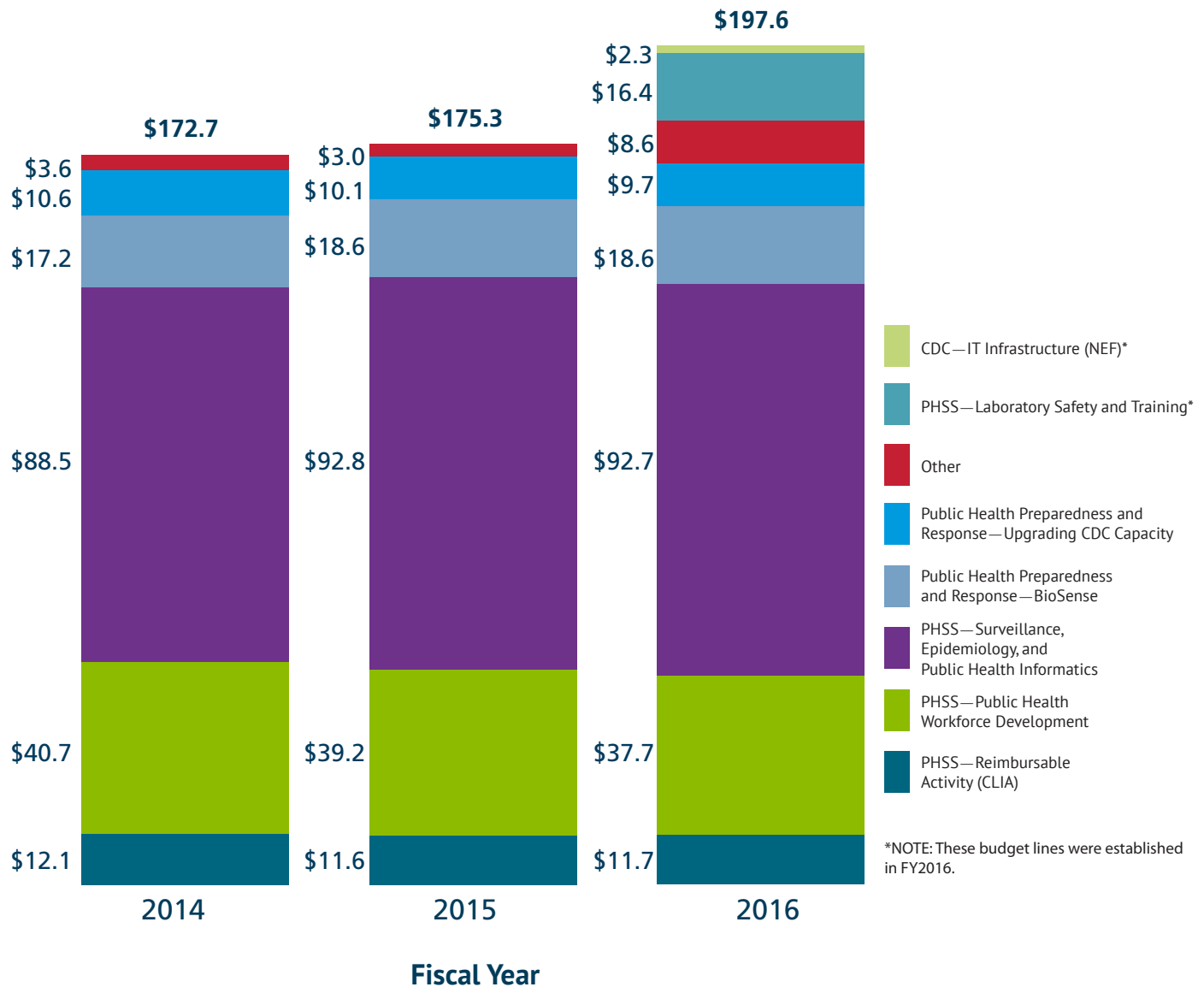


NOTE: The Technology Transfer Office, Behavior Risk Factor Surveillance System, and Select Agent Program did not transfer to CSELS from the former OSELS in October 2013.

These bar graphs show how CSELS funds are allocated from the overall CDC budget. Since 2014, our largest source of funding came from the PHSS budget line for surveillance, epidemiology, and informatics.

CSELS Budget Allocation History

Amount (in Millions)



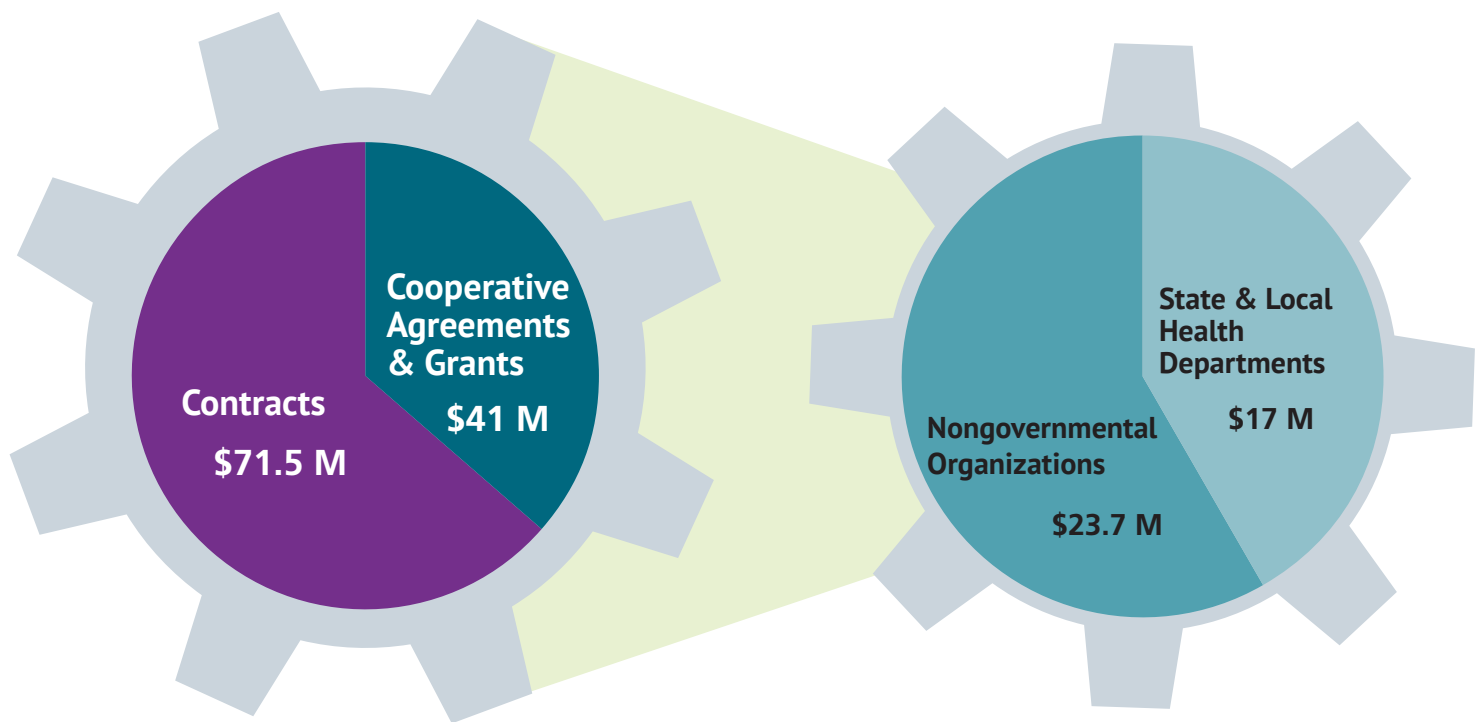
Other CDC centers, institutes, and offices contribute funds to CSELS to support laboratory training and the Laboratory Leadership Service Fellowship Program. They also support countermeasure tracking, information systems, and surveillance systems, as well as the CDC Library's journal access system used by researchers across the agency.

Where Our Funding Goes

In FY2016, CSELS distributed \$112.5 million of its annual budget as extramural funding. More than 60% of this money was distributed through contracts, with the rest awarded through cooperative agreements and grants. Most of the cooperative agreement and grant dollars (nearly 60%) went to nongovernmental organizations such as medical and professional associations, healthcare groups, and nonprofit groups and foundations.

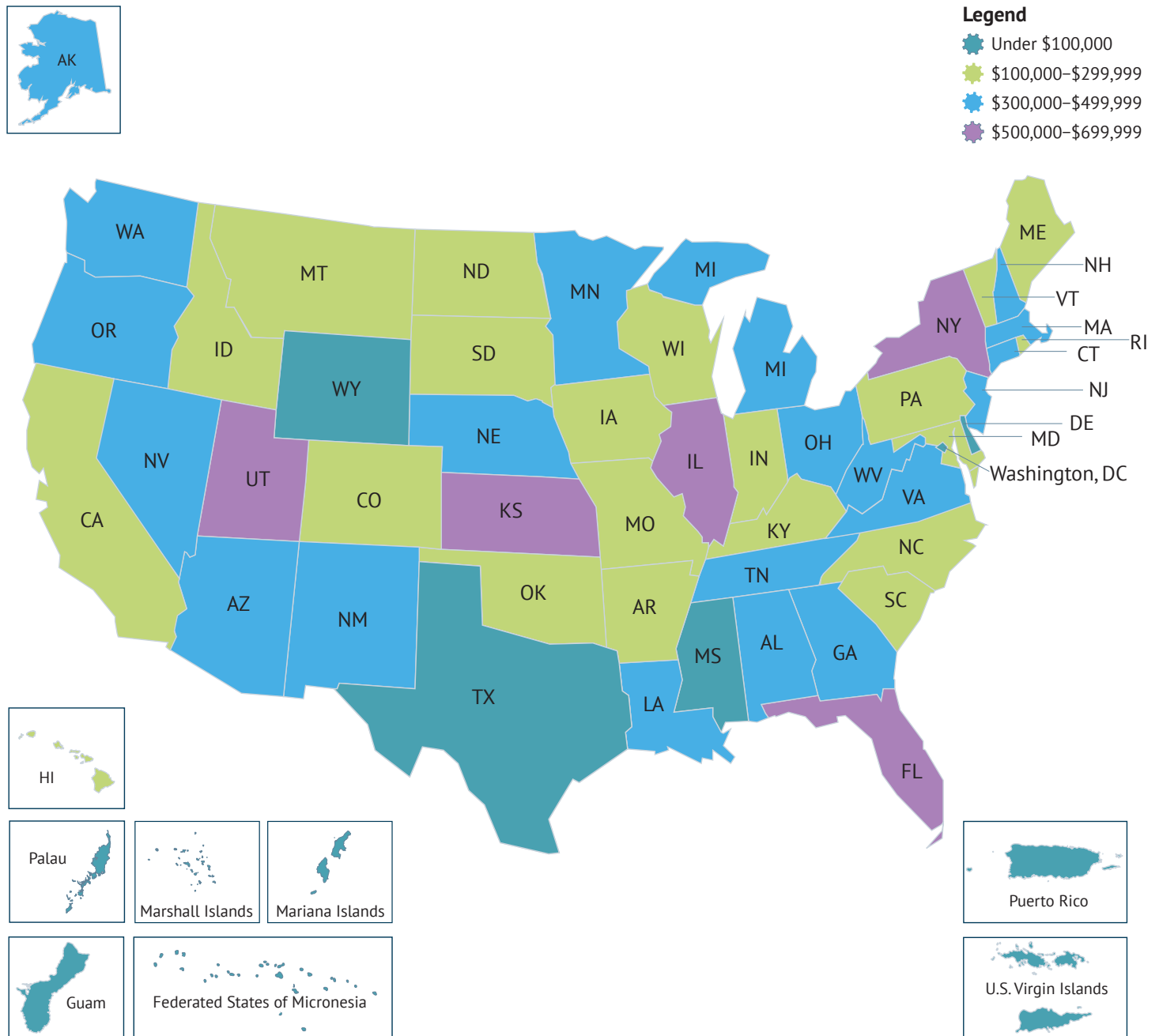
**Total FY2016 Extramural Funding
\$112.5 million**

**FY2016 Extramural Funding Breakdown
Cooperative Agreements and Grants**



CSELS extramural funding goes to groups outside of CDC to support public health systems, work force, and partners

National Distribution of CSELS Grants in FY2016

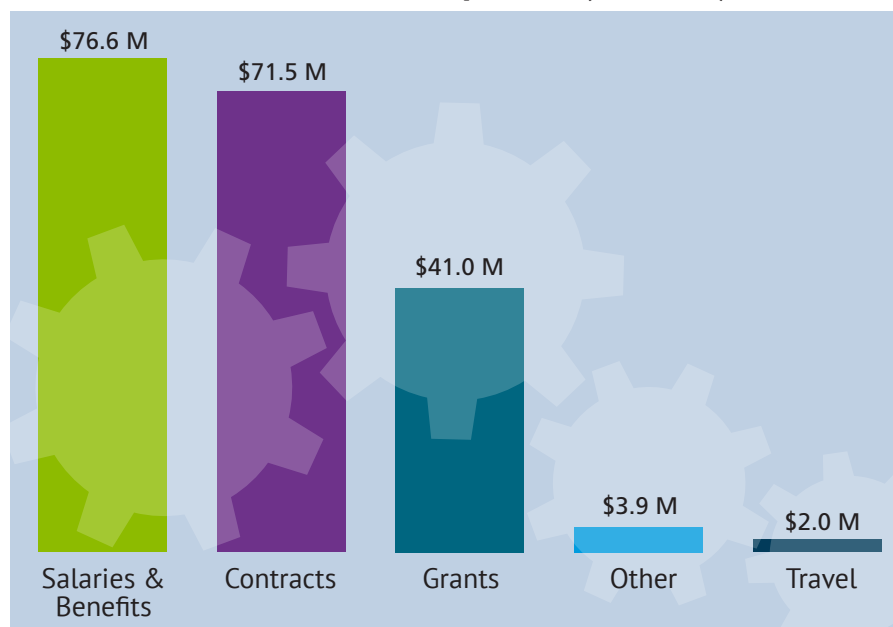


In FY2016, CSELS awarded \$17 million in grants to health departments in 50 states and 7 U.S. territories

How We Manage Our Funding

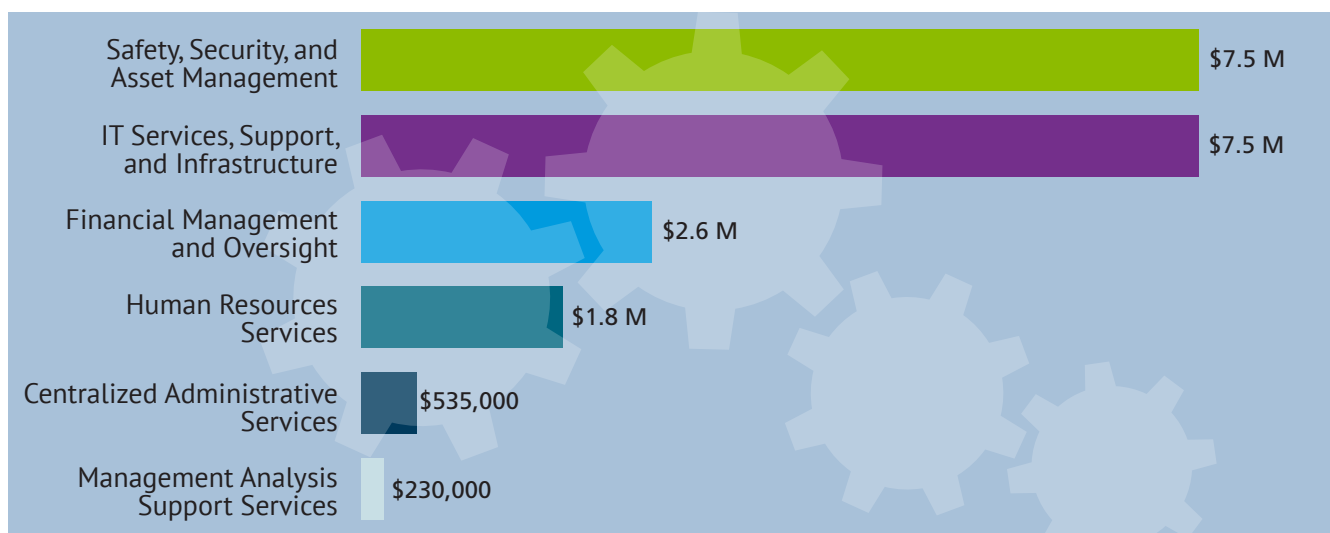
CSELS operates on a lean, streamlined budget. More than half our money goes outside CDC to support work within the public health community through contracts and grants. Our biggest expense is human capital—the staff who conduct and coordinate the work of our programs. The scientific and technical expertise needed for the highly specialized and varied work we do means that we need a skilled and stable workforce within CSELS.

CSELS FY2016 Expenses (\$194 M)



CDC established a Working Capital Fund in FY2014. The Working Capital Fund is a mechanism government agencies use to finance centralized business support services. It's a revolving fund with no-year authority. Services covered by the fund—such as safety and security, IT services, and human resources—are performed at pre-established rates. Fees collected are deposited into the Working Capital Fund to pay for operations and finance future investments. CSELS uses the Working Capital Fund for the centralized services that support our internal operations.

CSELS Working Capital Fund—FY2016 Projected Costs (\$20.1 M)





A CDC laboratory worker in the 1970s performs a cephalin-cholesterol flocculation test, which measures levels of a certain group of proteins in the blood. This test can help diagnose liver diseases, a type of heart disease, rheumatoid arthritis, and malaria. In FY2015, CSELS invested more than \$19 million in strengthening the capability, sustainability, and quality of laboratory science, policy, and practice.



CSELS Cover to Cover: Behind the Scenes

This photo—taken by Jennifer McQuiston, DVM, MS, CDC Scientific Advisor for Public Affairs and Captain in the U.S. PHS—shows what it took to get the cover shot of EIS Officer Leisha Nolan, MD, PhD. CDC Biomedical Photographer, James Gathany, was literally down in the dirt photographing Dr. Nolan as she performed field work.

Jim assumed this dramatic posture to capture the sole of Dr. Nolan's shoe, harkening back to EIS's iconic "sole of the shoe" image which reflects the program's commitment to shoe leather epidemiology. This photo was a winner in the 2015 CDC Connects, Public Health in Action Photo Contest.

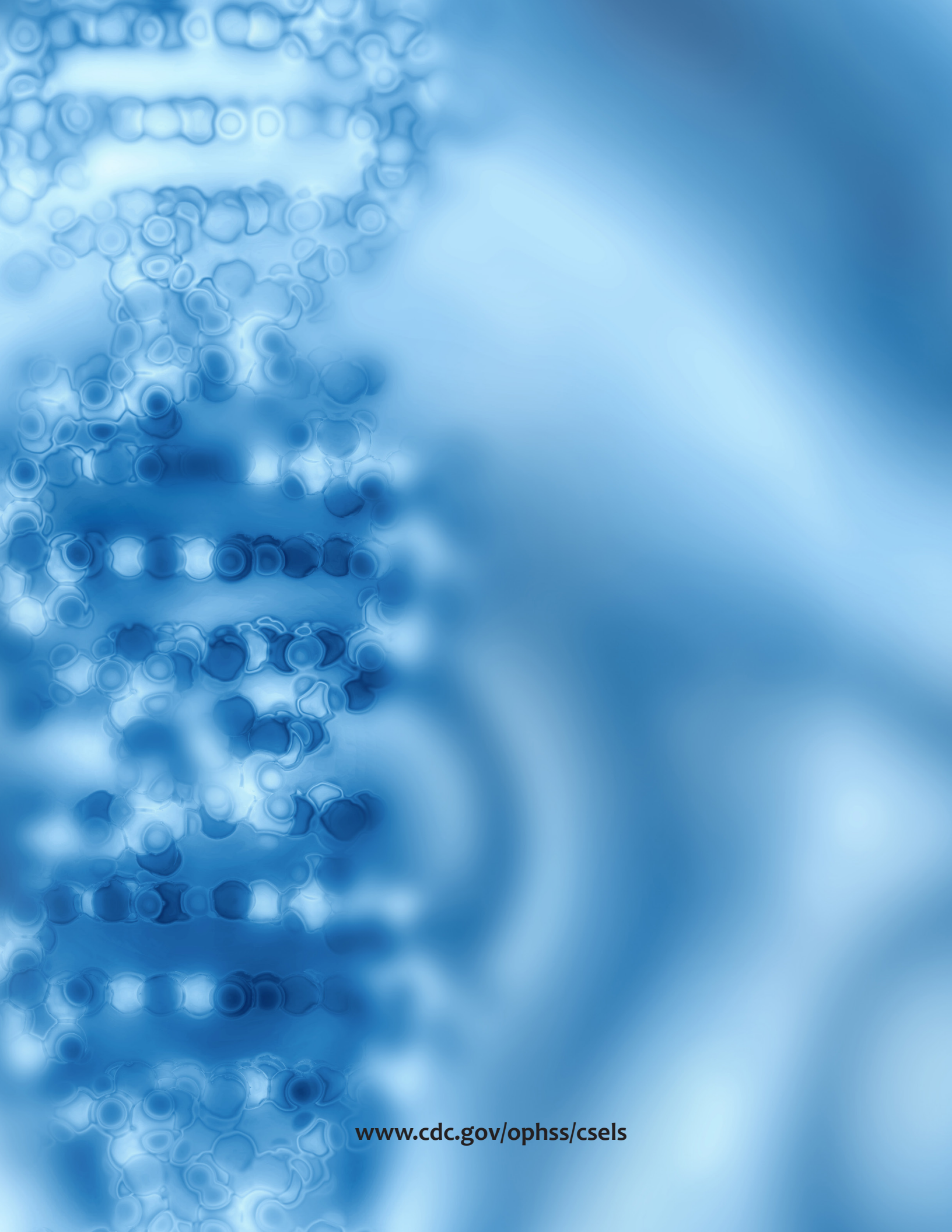
FOR MORE INFORMATION

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